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# THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

EDITED BY

THEO. S. CASE.

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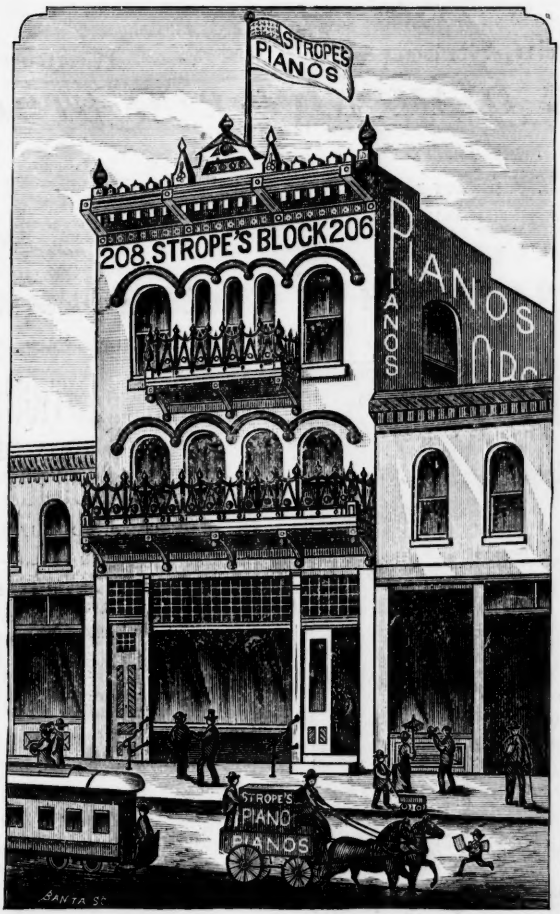


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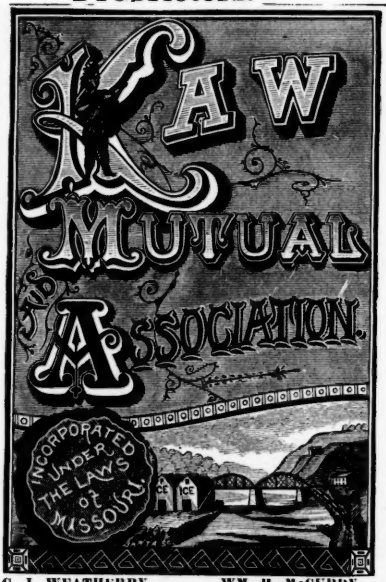


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# REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VII. AUGUST, 1883. NO. 4.

## ASTRONOMY.

### ECLIPSES FROM 1800 TO 1900.

WM. DAWSON, SPICELAND, IND.

It has been my intention to give in the catalogue below the date of every eclipse of the 19th century; though I think it possible that one or two very small ones may not have been found. I am satisfied that no one of much size or importance has been omitted. Most of those from 1800 to 1850 were determined by the Saros, though several were calculated by a more tedious and accurate process—as a check on Saros determinations, and to find some particulars which the Saros cannot give. The eclipses of 1800, of course, are not counted in this century, but given as a sort of convenience.

The dates given are intended to be the nearest hour of *Washington Time*, though it is probable that some in the early part of the century may be rather more than an hour from the time of actual occurrence. A catalogue in Chamber's astronomy is the basis for many in the last half of the century. Those of 1866 to 1885 inclusive, were copied from the Nautical Almanac with the addition of the Node, which in all cases, I have given mainly to ascertain (at thought) the direction of series of eclipses, especially solar ones. Those at the descending node tend northward; while those at the ascending node go south.

In glancing over the table we soon observe that eclipses generally occur two

or three in a month's time, then no more for nearly half a year. More than three can never occur at the same node; and it takes nearly six months for the Sun to pass half round—from one node to the other. Thus there are always two eclipse seasons in a year; and when one occurs near the first of January a third one sets in near the close of December. It will also be noticed that they return about twenty days earlier each year—caused by the nodes falling back on the ecliptic—being in April and October in 1800; and mostly in January and July in 1805. So in eighteen years and eleven days they go through the full circle of the ecliptic and return to April and October; but ten or eleven days later in the months. Here we see an indication of the Saros, the use and application of which were described in the REVIEW for March, 1882. You may take either of the eclipses of 1800 and find that it recurred every eighteen years and ten or eleven days through the century, excepting the lunar eclipse of October 2d, which disappeared, or *wore off*, in 1872, November 14th.

The eclipse of 1835, June 10th, was the first one of a new series. So was that of July 28, 1870. A series of solar eclipses "wore off" in 1859, February 2d, near South Pole (being at the "A. N.") The eclipse of 1890, June 3d, is the last of that series—until it comes round again in about 13,000 years. Thus a set of eclipses begins, or one ends, on an average of about every Saros. The size or magnitude, given in the table, is the largest that the eclipse appears anywhere on the earth. A central eclipse of the Sun with its partial eclipse each side of the Central Line extends over a belt of the world 4,000 to 5,000 miles wide, and about 10,000 miles long—bearing northeasterly when it occurs at the A. N., and southeasterly when at the D. N. When two places are named in the column "where visible," for the Sun they indicate, approximately, the beginning and end of the Central Line; and for the Moon, the middle meridian of the hemisphere in which it is visible.

It may be observed that no United States *year* of the century produced seven eclipses. But an eclipse of the Sun occurred 1804, December 31, 8 P. M., which was January 1st, 1 A. M., 1805, in England. Now, there were six eclipses after this one in that year—making seven eclipses (the greatest number that can ever be in one year) in 1805 in the eastern hemisphere; but only six in the same year of western hemisphere time. There were nearly seven eclipses in 1823—the last one occurring about four hours after New Year's day, 1824, Washington time. But about five hours, or 75°, west of Washington, it was still 1823 when the eclipse took place. So there was a narrow belt of Central Pacific—probably including Sandwich and Society Islands—where seven eclipses occurred in its year 1823. In the first fifty years of the century there were 199 eclipses; and 196 in the last fifty years—395 in all.

ECLIPSES FROM 1800 TO 1900 A. D.

| YEAR. | | DATE. | TIME. | MAGNI-TUDE. | NODE. | WHERE VISIBLE. |
|---|---|---|---|---|---|---|
| 1800 | Moon. | April 9th, | Noon. | 0.3 | D. N. | Asia. |
| " | Sun. | April 23d, | 4 P. M. | Ann. | A. N. | Oregon. |
| " | Moon. | October 2d, | 5 P. M. | 0.3 | A. N. | Europe. |
| " | Sun. | October 17th, | 7 A. M. | Ann. | D. N. | South of Cape Good Hope. |
| 1801 | Moon. | March 29th, | 11 P. M. | Total. | D. N. | United States. |
| " | Sun. | April 12th, | 9 P. M. | 0.6 | A. N. | Nova Zembla. |
| " | Moon. | Septemb'r 22d, | 4 A. M. | Total. | A. N. | Western America. |
| " | Sun. | October 7th, | 3 P. M. | 0.3 | D. N. | Antarctic Continent. |
| 1802 | Sun. | March 4th, | 1 A. M. | Total. | A. N. | Indian Ocean. |
| " | Moon. | March 19th, | 4 A. M. | 0.6 | D. N. | Western America, Pacific. |
| " | Sun. | August 27th, | 10 P. M. | Total. | D. N. | North Pacific. |
| " | Moon. | Septemb'r 11th | 3 P. M. | 0.8 | A. N. | Western Asia. |
| 1803 | Sun. | February 21st, | 7 P. M. | Total. | A. N. | Central Pacific. |
| " | Sun. | August 17th, | 1 A. M. | Ann. | D. N. | Black Sea to New Guinea. |
| 1804 | Moon. | January 26th, | 6 P. M. | 0.4 | D. N. | Europe. |
| " | Sun. | February 12th, | 9 A. M. | Ann. | A. N. | West Indies, Turkey. |
| " | Moon. | July 22d, | 11 A. M. | 0.9 | A. N. | China, Sumatra. |
| " | Sun. | August 5th, | Noon. | Total. | D. N. | Patagonia. |
| " | Sun. | Decemb'r 31st | 8 P. M. | 0.3 | A. N. | South Pole. |
| 1805 | Moon. | January 15th, | 4 A. M. | Total. | D. N. | Western America, Pacific. |
| " | Sun. | January 30th, | 3 P. M. | 0.15 | A. N. | Russian America. |
| " | Sun. | June 26th, | 6 P. M. | 0.5 | D. N. | Eastern Siberia. |
| " | Moon. | July 10th, | Noon. | Total. | A. N. | China, Sumatra. |
| " | Sun. | July 25th, | Midnight. | 0.7 | D. N. | South of Cape Good Hope. |
| " | Sun. | Decemb'r 20th | 8 P. M. | Total. | A. N. | South Pole. |
| 1806 | Moon. | January 4th, | 10 P. M. | 0.9 | D. N. | South America. |
| " | Sun. | June 16th, | 11 A. M. | Total. | D. N. | Ohio, New York. |
| " | Moon. | June 30th, | 1 P. M. | 0 1 | A. N. | Eastern Asia. |
| " | Sun. | December 9th, | Midnight. | Ann. | A. N. | North Australia. |
| 1807 | Sun. | June 5th, | 10 P. M. | Ann. | D. N. | Sandwich Islands. |
| " | Moon. | Novemb'r 15th | 3 A. M. | 0.3 | D. N. | United States, Pacific. |
| " | Sun. | Novemb'r 29th | Noon. | Total. | A. N. | Cuba, Gibraltar. |
| 1808 | Moon. | May 10th, | 2 A. M. | Total. | A. N. | United States. |
| " | Sun. | May 25th, | 2 A. M. | 0.9 | D. N. | Australia. |
| " | Sun. | October 19th, | 3 P. M. | 0.2 | A. N. | South Pacific. |
| " | Moon. | November 3d, | 4 A. M. | Total. | D. N. | Western America. |
| " | Sun. | Novemb'r 17th | Midnight. | 0.6 | A. N. | Northern Asia. |
| 1809 | Sun. | April 14th, | Noon. | 0.8 | D. N. | British America. |
| " | Moon. | April 29th, | 7 P. M. | Total. | A. N. | Europe and Africa. |
| " | Sun. | October 9th, | 5 A. M. | Ann. | A. N. | Southern Africa. |
| " | Moon. | October 23d, | 5 A. M. | 0.9 | D. N. | California. |
| 1810 | Sun. | April 3d, | 8 P. M. | Total. | D. N. | North Pacific. |
| " | Sun. | Novemb'r 28th | Noon. | Ann. | A. N. | South America. |
| 1811 | Moon. | March 10th, | 2 A. M. | 0.2 | A. N. | United States. |
| " | Sun. | March 24th, | 9 A. M. | Total. | D. N. | S. America, South'n Africa. |
| " | Moon. | September 2d, | 7 P. M. | 0.3 | D. N. | Africa, Europe. |

| YEAR. | | DATE. | TIME. | MAGNITUDE. | NODE. | WHERE VISIBLE. |
|---|---|---|---|---|---|---|
| 1811 | Sun. | Septemb'r 17th | 1 P. M. | Ann. | A. N. | United States. |
| 1812 | Sun. | February 12th, | 6 P. M. | 0.3 | D. N. | Eastern Siberia. |
| " | Moon. | February 25th, | Midnight. | Total. | A. N. | Eastern United States. |
| " | Sun. | March 13th, | 2 A. M. | 0.5 | D. N. | South of Australia. |
| " | Moon. | August 22d, | 10 A. M. | Total. | D. N. | Japan, Australia. |
| " | Sun. | Septemb'r 5th, | 1 P. M. | 0.3 | A. N. | Greenland. |
| 1813 | Sun. | February 1st, | 9 A. M. | Ann. | D. N. | South Europe, Florida. |
| " | Moon. | February 15th, | 4 A. M. | Total. | A. N. | Eastern Pacific. |
| " | Sun. | July 27th, | 10 A. M. | Total. | A. N. | South Atlantic. |
| " | Moon. | August 11th, | 8 P. M. | 0.9 | D. N. | Europe, Africa. |
| 1814 | Sun. | January 21st, | 10 A. M. | Ann. | D. N. | Brazil. |
| " | Sun. | July 17th, | 1 A. M. | Total. | A. N. | Hindostan, Borneo. |
| " | Moon. | Decemb'r 26th | 10 P. M. | 0.6 | A. N. | United States. |
| 1815 | Sun. | January 10th, | 10 A. M. | Ann. | D. N. | South Atlantic. |
| " | Moon. | June 21st, | 10 A. M. | Total. | D. N. | Pacific. |
| " | Sun. | July 6th, | 6 P. M. | Total. | A. N. | British America. |
| " | Moon. | Decemb'r 16th | 11 A. M. | Total. | A. N. | Japan. |
| " | Sun. | Decemb'r 30th | 11 A. M. | 0.4 | D. N. | Near South Pole. |
| 1816 | Sun. | May 26th, | 8 P. M. | 0.8 | A. N. | East of Australia. |
| " | Moon. | June 9th, | 7 P. M. | Total. | D. N. | Africa. |
| " | Sun. | Novemb'r 19th | 8 A. M. | Total. | D. N. | Southern Spain. |
| " | Moon. | December 4th, | 5 P. M. | 0.5 | A. N. | Europe. |
| 1817 | Sun. | May 15th, | 11 P. M. | Ann. | A. N. | East Indies. |
| " | Sun. | November 8th, | Midnight. | Total. | D. N. | Australia. |
| 1818 | Moon. | April 20th, | 7 P. M. | 0.2 | D. N. | England, Africa. |
| " | Sun. | May 4th, | 12 P. M. | Ann. | A. N. | Southeastern Siberia. |
| " | Moon. | October 14th, | 1 A. M. | 0.2 | A. N. | United States. |
| " | Sun. | October 28th, | 3 P. M. | Ann. | D. N. | Cape Horn. |
| 1819 | Moon. | April 10th, | 7 A. M. | Total. | D. N. | Central Pacific. |
| " | Sun. | April 24th, | 5 A. M. | 0.7 | A. N. | Greenland, Siberia. |
| " | Moon. | October 3d, | Noon. | Total. | A. N. | Central Asia. |
| " | Sun. | October 18th, | 11 P. M. | 0.3 | D. N. | Near South Pole. |
| 1820 | Sun. | March 14th, | 6 A. M. | Total. | A. N. | South Atlantic, S. Africa. |
| " | Moon. | March 29th, | Noon. | 0.7 | D. N. | India, Indian Ocean. |
| " | Sun. | September 7th, | 6 A. M. | Ann. | D. N. | North Europe, North Asia. |
| " | Moon. | Septemb'r 21st | 11 P. M. | 0.9 | A. N. | United States. |
| 1821 | Sun. | March 4th, | 3 A. M. | Total. | A. N. | Southeast Africa. |
| " | Sun. | August 27th, | 9 A. M. | Ann. | D. N. | West Africa. |
| 1822 | Moon. | February 6th, | 2 A. M. | 0.3 | D. N. | United States. |
| " | Sun. | February 22d, | 5 P. M. | Ann. | A. N. | Northwest America. |
| " | Moon. | August 2d, | 5 P. M. | 0.8 | A. N. | Africa. |
| " | Sun. | August 16th, | 6 P. M. | Total. | D. N. | Southern Pacific. |
| 1823 | Sun. | January 12th, | 4 A. M. | 0.02 | A. N. | South Pole. |
| " | Moon. | January 26th, | 1 P. M. | 1.73 | D. N. | China. |
| " | Sun. | February 10th, | 11 P. M. | 0.20 | A. N. | Northern Europe. |
| " | Sun. | July 8th, | 1 A. M. | 0.33 | D. N. | Southern Siberia. |
| " | Moon. | July 22d, | 7 P. M. | 1.5 | A. N. | Atlantic, Africa. |

| YEAR. | | DATE. | TIME. | MAGNITUDE. | NODE. | WHERE VISIBLE. |
|---|---|---|---|---|---|---|
| 1823 | Sun. | August 6th, | 9 A. M. | 0.5 | D. N. | South of Cape Horn. |
| 1824 | Sun. | January 1st, | 4 A. M. | Ann. | A. N. | Indian Ocean. |
| " | Moon. | January 16th, | 4 A. M. | 0.78 | D. N. | America. |
| " | Sun. | June 26th, | 5 P. M. | Total. | D. N. | Western United States. |
| " | Moon. | July 10th, | 8 P. M. | 0.1 | A. N. | Africa. |
| " | Sun. | Decemb'r 20th | 8 A. M. | Ann. | A. N. | Atlantic, Africa. |
| 1825 | Sun. | June 16th, | 5 A. M. | Ann. | D. N. | Africa. |
| " | Moon. | Novemb'r 25th | Noon. | 0.2 | D. N. | Sumatra, China. |
| " | Sun. | December 9th, | 7 P. M. | Total. | A. N. | North Central Pacific. |
| 1826 | Moon. | May 21st, | 10 A. M. | Total. | A. N. | Pacific Ocean. |
| " | Sun. | June 5th, | 10 A. M. | Ann. | D. N. | South Atlantic. |
| " | Sun. | October 30th, | 11 P. M. | 0.1 | A. N. | Near Cape Horn. |
| " | Moon. | Novemb'r 14th | Noon. | Total. | D. N. | China, Sumatra. |
| " | Sun. | Novemb'r 29th | 9 A. M. | 0.7 | A. N. | Greenland. |
| 1827 | Sun. | April 25th, | 8 P. M. | 0.9 | D. N. | North of Behring Strait. |
| " | Moon. | May 11th, | 3 A. M. | Total. | A. N. | Western United States. |
| " | Sun. | October 20th, | 1 P. M. | Ann. | A. N. | Southeast of Cape Horn. |
| " | Moon. | November 3d, | 1 P. M. | 0.8 | D. N | Russia, Indian Ocean. |
| 1828 | Sun. | April 14th, | 4 A. M. | Total. | D. N. | Hindoostan. |
| " | Sun. | October 9th, | 1 A. M. | Ann. | A. N. | Australia, Cape Horn. |
| 1829 | Moon. | March 20th, | 8 A. M. | 0.2 | A. N. | Eastern Pacific. |
| " | Sun. | April 3d, | 5 P. M. | Total. | D. N. | South Pacific. |
| " | Moon. | Septemb'r 13th | 2 A. M. | 0.4 | D. N. | United States. |
| " | Sun. | Septemb'r 27th | 8 P. M. | Ann. | A. N. | Central Pacific. |
| 1830 | Sun. | February 24th, | 1 A. M. | 0.3 | D. N. | Eastern Siberia. |
| " | Moon. | March 9th, | 8 A. M. | Total. | A. N. | Japan. |
| " | Sun. | March 24th, | 9 A. M. | 0.5 | D. N. | Cape Horn. |
| " | Moon. | September 2d, | 5 P. M. | Total. | D. N. | Eastern Europe. |
| " | Sun. | Septemb'r 16th | 8 P. M. | 0.4 | A. N. | Siberia. |
| 1831 | Sun. | February 12th | 1 P. M. | Ann. | D. N. | New York, Massachusetts. |
| " | Moon. | February 26th | Noon. | 0.9 | A. N. | China, Sumatra. |
| " | Sun. | August 7th, | 5 P. M. | Total. | A. N. | South Pacific. |
| " | Moon. | August 23d, | 4 A. M. | 0.9 | D. N. | Pacific Ocean. |
| 1832 | Sun. | February 1st, | 5 P. M. | Ann. | D. N. | Sandwich Islands. |
| " | Sun. | July 27th, | 8 A. M. | Total. | A. N. | Brazil. |
| 1833 | Moon. | January 6th, | 3 A. M. | 0.5 | A. N. | California. |
| " | Sun. | January 20th, | 5 P. M. | Ann. | D. N. | South Pacific. |
| " | Moon. | July 1st, | 7 P. M. | 0.9 | D. N. | Europe, Africa. |
| " | Sun. | July 17th, | 1 A. M. | Total. | A. N. | Eastern Asia. |
| " | Moon. | Decemb'r 26th | 5 P. M. | Total. | A. N. | Europe. |
| 1834 | Sun. | January 9th | 6 P. M. | 0.41 | D. N. | Near South Pole. |
| " | Sun. | June 7th, | 3 A. M. | 0.8 | A. N. | Indian Ocean. |
| " | Moon. | June 21st, | 2 A. M. | Total. | D. N. | United States. |
| " | Sun. | Novemb'r 30th | 2 P. M. | Total. | D. N. | United States. |
| " | Moon. | Decemb'r 15th | Midnight. | 0.6 | A. N. | United States. |
| 1835 | Sun. | May 27th, | 6 A. M. | Ann. | A. N. | South Atlantic. |
| " | Moon. | June 10th, | 5 P. M. | 0.05 | D. N. | Russia, Africa. |

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|---|---|---|---|---|---|---|
| 1835 | Sun. | Novemb'r 20th | 7 A. M. | Total. | D. N. | S. America, S. Atlantic. |
| 1836 | Moon. | May 1st, | 2 A. M. | 0.2 | D. N. | United States. |
| " | Sun. | May 15th, | 8 A. M. | Ann. | A. N. | England. |
| " | Moon. | October 24th, | 8 A. M. | 0.2 | A. N. | Japan, Australia. |
| " | Sun. | November 8th | 10 P. M. | Ann. | D. N. | South of Australia. |
| 1837 | Moon. | April 20th, | 2 P. M. | Total. | D. N. | Asia. |
| " | Sun. | May 4th, | 1 P. M. | 0.7 | A. N. | Hudson's Bay. |
| " | Moon. | October 13th, | 6 P. M. | Total. | A. N. | Europe, Africa. |
| " | Sun. | October 29th, | 6 A. M. | 0.3 | D. N. | Near South Pole. |
| 1838 | Sun. | March 25th, | 4 P. M. | Total. | A. N. | South Pacific. |
| " | Moon. | April 9th, | 7 P. M. | 0.7 | D. N. | Western Asia. |
| " | Sun. | Septemb'r 18th | 1 P. M. | Ann. | D. N. | British America, N. Atlantic |
| " | Moon. | October 3d, | 6 A. M. | 0.9 | A. N. | Central Pacific. |
| 1839 | Sun. | March 15th, | 10 A. M. | Total. | A. N. | Guinea. |
| " | Sun | Septemb'r 7th, | 4 P. M. | Ann. | D. N. | Central Pacific. |
| 1840 | Moon. | February 17th | 9 A. M. | 0.3 | D. N. | Japan, Australia. |
| " | Sun. | March 3d, | Midnight. | Ann. | A. N. | Siberia. |
| " | Moon. | August 13th, | 1 A. M. | 0.6 | A. N. | United States. |
| " | Sun. | August 27th, | 2 A. M. | Total. | D. N. | Indian Ocean. |
| 1841 | Sun. | January 22d, | Noon. | 0.02 | A. N. | South Pole. |
| " | Moon. | February 5th, | 9 P. M. | Total. | D. N. | United States, Atlantic. |
| " | Sun. | February 21st, | 6 A. M. | 0.2 | A. N. | Greenland, Russia. |
| " | Moon. | August 2d, | 5 A. M. | Total. | A. N. | Pacific. |
| " | Sun. | July 18th, | 9 A. M. | 0.3 | D. N. | Baffin's Bay to Germany. |
| " | Sun. | August 16th, | 4 P. M. | 0.5 | A. N. | Antarctic Continent. |
| 1842 | Sun. | January 11th, | Noon. | Ann. | A. N. | South America. |
| " | Moon. | January 26th, | 2 P. M. | 0.8 | D. N | Asia. |
| " | Sun. | July 7th, | Midnight. | Total. | D. N. | Eastern Europe. |
| " | Moon. | July 22d, | 4 A. M. | 0.3 | A. N. | Pacific. |
| " | Sun. | December 31st | 3 P. M. | Ann. | A. N. | Southern Pacific. |
| 1843 | Sun. | June 27th, | 2 P. M. | Ann. | D. N. | Marquesas Island, Bolivia. |
| " | Moon. | December 6th, | 8 P. M. | 0.3 | D. N. | Europe. |
| " | Sun. | Decemb'r 21st | 2 A. M. | Total. | A. N. | China, Niphon. |
| 1844 | Moon. | May 31st, | 5 P. M. | Total. | A. N. | Europe, Africa. |
| " | Sun. | June 15th, | 5 P. M. | 0.9 | D. N. | South Pacific. |
| " | Sun. | Novemb'r 10th | 6 A. M. | 0.1 | A. N. | South Pacific. |
| " | Moon. | Novemb'r 24th | 7 P. M. | Total. | D. N. | Atlantic. |
| " | Sun. | December 9th, | 7 P. M. | 0.7 | A. N. | Russian America. |
| 1845 | Sun. | May 6th, | 3 A. M. | 0.7 | D. N. | Siberia. |
| " | Moon. | May 21st, | 10 A. M. | Total. | A. N. | China, Australia. |
| " | Sun. | October 30th, | 8 P. M. | Ann. | A. N. | South Australia. |
| " | Moon. | Novemb'r 13th | 8 P. M. | 0.9 | D. N. | Eastern Atlantic. |
| 1846 | Sun. | April 25th, | Noon. | Ann. | D. N. | Mexico, West Indies. |
| " | Sun. | October 20th, | 3 A. M. | Ann. | A. N. | South Africa, Indian Ocean. |
| 1847 | Moon. | March 31st, | 4 P. M. | 0.2 | A. N. | Europe, Africa. |
| " | Sun. | April 15th, | 1 A. M. | Total. | D. N. | Indian Ocean. |
| " | Moon. | Septemb'r 24th | 10 A. M. | 0.4 | D. N. | Japan, Australia. |

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|---|---|---|---|---|---|---|
| 1847 | Sun. | October 9th, | 4 A. M. | Ann. | A. N. | Egypt, East Indies. |
| 1848 | Sun. | March 5th, | 9 A. M. | 0.2 | D. N. | Northern Europe. |
| " | Moon. | March 19th, | 4 P. M. | Total. | A. N. | Europe, Africa. |
| " | Sun. | April 3d, | 5 P. M. | 0.6 | D. N. | South Pacific. |
| " | Moon. | Septemb'r 12th | Midnight. | Total. | D. N | United States. |
| " | Sun. | Septemb'r 27th | 4 A. M. | 0.5 | A. N. | Russia. |
| 1849 | Sun. | February 22d, | 9 P. M. | Ann. | D. N. | North Pacific. |
| " | Moon. | March 8th, | 7 P. M. | 0.8 | A. N. | Atlantic. |
| " | Sun. | August 18th, | 1 A. M. | Total. | A. N. | Indian Ocean. |
| " | Moon. | September 2d, | Noon. | 0.7 | D. N. | China, Australia. |
| 1850 | Sun. | February 14th, | 1 A. M. | Ann. | D. N. | Hindostan. |
| " | Sun. | August 7th, | 4 P. M. | Total. | A. N. | Sandwich Islands. |
| 1851 | Moon. | January 17th, | Noon. | 0.5 | A. N. | China, Australia. |
| " | Sun. | January 31st, | Midnight. | Ann. | D. N. | Indian Ocean. |
| " | Moon. | July 13th, | 2 A. M. | 0.7 | D. N. | Western America. |
| " | Sun. | July 28th, | 10 A. M. | Total. | A. N. | North Atlantic. |
| 1852 | Moon. | January 7th, | 1 A. M. | 1.3 | A. N. | United States. |
| " | Sun. | June 17th, | 11 A. M. | 0.7 | A. N. | Cape Horn. |
| " | Moon. | July 1st, | 10 A. M. | 1.5 | D. N. | Japan, Australia. |
| " | Sun. | Decemb'r 10th | 11 P. M. | Total. | D. N. | Siberia, Japan. |
| " | Moon. | Decemb'r 26th | 8 A. M. | 0.7 | A. N. | Japan, Australia. |
| 1853 | Sun. | June 6th, | 2 P. M. | Ann. | A. N. | Society Islands, Peru. |
| " | Moon. | June 21st, | 1 A. M. | 0.2 | D. N. | United States. |
| " | Sun. | Novemb'r 30th | 2 P. M. | Total. | D. N. | Sandwich Islands, Brazil. |
| 1854 | Moon. | May 11th, | 11 A. M. | 0.2 | D. N. | China. |
| " | Sun. | May 26th, | 5 P. M. | Ann. | A. N. | Ladrones, United States |
| " | Moon. | November 4th | 4 P. M. | 0.1 | A. N. | Russia, Madagascar. |
| " | Sun. | Novemb'r 20th | 5 A. M. | Ann. | D. N. | Paraguay, Australia. |
| 1855 | Moon. | May 1st, | Midnight. | 1.6 | D. N. | United States. |
| " | Sun. | May 15th, | 9 P. M. | 0.8 | A. N. | Siberia. |
| " | Moon. | October 25th, | 3 A. M. | 1.6 | A. N. | Western America. |
| " | Sun. | November 9th | 3 P. M. | 0.4 | D. N. | Southwest of Cape Horn. |
| 1856 | Sun. | April 4th, | Midnight. | Total. | A. N. | Australia, New Zealand. |
| " | Moon. | April 20th, | 4 A. M. | 0.8 | D. N. | Pacific. |
| " | Sun. | Septemb'r 28th | 11 P. M. | Total. | D. N. | North Asia. |
| " | Moon. | October 13th, | 6 P. M. | 0.9 | A. N. | Western Asia. |
| 1857 | Sun. | March 25th, | 6 P. M. | Total. | A. N. | Australia, Mexico. |
| " | Sun. | Septemb'r 18th | 1 A. M. | Ann. | D. N. | Greece, India, New Guinea |
| 1858 | Moon. | February 27th | 5 P. M. | 0.3 | D. N | Russia, Egypt. |
| " | Sun. | March 15th, | 7 A. M. | Ann. | A. N. | West Indies, Russia. |
| " | Moon. | August 24th, | 9 A. M. | 0.5 | A. N. | Japan, Australia. |
| " | Sun. | September 7th | 9 A. M. | Total. | D. N. | Chili, South Africa. |
| 1859 | Sun. | February 2d, | 8 P. M. | 0.01 | A. N. | South Pole. |
| " | Moon. | February 17th | 6 A. M. | 1.6 | D. N. | Pacific. |
| " | Sun. | March 4th, | 2 A. M. | 0.3 | A. N. | Greenland. |
| " | Sun. | July 29th, | 5 P. M. | 0.3 | D. N. | Eastern Siberia. |
| " | Moon. | August 13th, | 10 A. M. | 1.6 | A. N. | China. |

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|---|---|---|---|---|---|---|
| 1859 | Sun. | August 28th, | 1 A. M. | 0 6 | D. N. | South of Cape Good Hope. |
| 1860 | Sun. | January 22d, | 7 P. M. | Ann. | A. N. | South Pacific. |
| " | Moon. | February 6th, | 10 P. M. | 0.8 | D. N. | Brazil, Newfoundland. |
| " | Sun. | July 18th, | 8 A. M. | Total. | D. N. | Labrador, Spain. |
| " | Moon. | August 1st, | Noon. | 0.4 | A. N. | China, Sumatra. |
| 1861 | Sun. | January 10th, | 11 P. M. | Ann. | A. N. | Australia. |
| " | Sun. | July 7th, | 8 P. M. | Ann. | D. N. | Java, Society Island. |
| " | Moon. | Decemb'r 17th | 4 A. M. | 0.2 | D. N. | Eastern Pacific. |
| " | Sun. | December 31st | 9 A. M. | Total. | A. N. | Carribean Sea, Greece. |
| 1862 | Moon. | June 12th, | 1 A. M. | 1.2 | A. N. | United States. |
| " | Sun. | June 27th, | 2 A. M. | 0.92 | D. N. | South Indian Ocean. |
| " | Sun. | Novemb'r 21st | 2 P. M. | 0.06 | A. N. | Near South Pole. |
| " | Moon. | December 6th, | 3 A. M. | 1.41 | D. N. | California. |
| " | Sun. | Decemb'r 20th | Midnight. | 0.70 | A. N. | Siberia. |
| 1863 | Sun. | May 17th, | 11 A. M. | 0.6 | D. N. | Greenland. |
| " | Moon. | June 1st, | 6 P. M. | 1.2 | A. N. | England, West Africa. |
| " | Sun. | Novemb'r 11th | 4 A. M. | Ann. | A. N. | Cape Good Hope, Tasmania |
| " | Moon. | Novemb'r 25th | 4 A. M. | 0.9 | D. N. | Eastern Pacific. |
| 1864 | Sun. | May 5th, | 7 P. M. | Total. | D. N. | Borneo, Sandwich Islands. |
| " | Sun. | October 30th, | 11 A. M. | Ann. | A. N. | Gallipagos, C. Good Hope. |
| 1865 | Moon. | April 10th, | Midnight. | 0.1 | A. N. | United States. |
| " | Sun. | April 25th, | 10 A. M. | Total. | D. N. | S. Pacific, C. Good Hope. |
| " | Moon. | October 4th, | 6 P. M. | 0.3 | D. N. | Europe, Africa. |
| " | Sun. | October 19th, | Noon. | Ann. | A. N. | Slave Lake, Cape Verd Il. |
| 1866 | Sun. | March 16th, | 5 P. M. | 0.21 | D. N. | Eastern Siberia. |
| " | Moon. | March 30th, | 11 P. M. | 1.42 | A. N. | United States. |
| " | Sun. | April 15th, | 1 A. M. | 0.66 | D. N. | South of Australia. |
| " | Moon. | Septemb'r 24th | 9 A. M. | 1.62 | D. N. | Japan, Australia. |
| " | Sun. | October 8th, | 11 A. M. | 0.57 | A. N. | Iceland. |
| 186, | Sun. | March 6th, | 5 A. M. | Ann. | D. N. | Gibraltar, Tobolsk. |
| " | Moon. | March 20th, | 4 A. M. | 0 81 | A. N. | Sandwich Islands. |
| " | Sun. | August 29th, | 8 A. M. | Total. | A. N. | South Atlantic, Patagonia. |
| " | Moon. | Septemb'r 13th | 7 P. M. | 0.70 | D. N. | Europe, Africa. |
| 1868 | Sun. | February 23d, | 9 A. M. | Ann. | D. N. | South Pacific, Egypt. |
| " | Sun. | August 17th, | Midnight. | Total. | A. N. | Arabia, North Australia. |
| 1869 | Moon. | January 27th, | 8 P. M. | 0.46 | A. N. | United States. |
| " | Sun. | February 11th | 8 A. M. | Ann. | D. N. | Cape Horn, C. Good Hope |
| " | Moon. | July 23d, | 9 A. M. | 0.57 | D. N. | Pacific. |
| " | Sun. | August 7th, | 5 P. M. | Total. | A. N. | Iowa, North Carolina. |
| 1870 | Moon. | January 17th, | 10 A. M. | 1.66 | A. N. | Japan, Australia. |
| " | Sun. | January 31st, | 10 A. M. | 0.48 | D. N. | Near South Pole. |
| " | Sun. | June 28th, | 7 P. M. | 0.63 | A. N. | Southeast of Australia. |
| " | Moon. | July 12th, | 5 P. M. | 1.69 | D. N. | Europe, Africa. |
| " | Sun. | July 28th, | 5 A. M. | 0.07 | A. N. | East Siberia. |
| " | Sun. | Decemb'r 22d | 7 A. M. | Total. | D. N. | Spain, Black Sea. |
| 1871 | Moon. | January 6th, | 4 P. M. | 0.69 | A. N. | Europe, Africa. |
| " | Sun. | June 17th, | 9 P. M. | Ann. | A. N. | Northwest Australia. |

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|---|---|---|---|---|---|---|
| 1871 | Moon. | July 2d, | 8 A. M. | 0.35 | D. N. | Pacific Ocean. |
| " | Sun. | Decemb'r 11th | 11 P. M. | Total. | D. N. | Hindoostan, N. Australia. |
| 1872 | Moon. | May 22d, | 6 P. M. | 0.12 | D. N. | England, Guinea. [Islands |
| " | Sun. | June 5th, | 10 P. M. | Ann. | D. N. | Hindostan, Pekin, Sandw'h |
| " | Moon. | Novemb'r 14th | 11 P. M. | 0.03 | A. N. | United States. |
| " | Sun. | Novemb'r 30th | 2 P. M. | Ann. | A. N. | Friendly Islands, C. Horn. |
| 1873 | Moon. | May 12th, | 6 A. M. | 1.44 | D. N. | Pacific Ocean. |
| " | Sun. | May 26th, | 4 A. M. | 0.90 | A. N. | Greenland, Siberia. |
| " | Moon. | November 4th | 11 A. M. | 1.43 | A. N. | China, Australia. |
| " | Sun. | Novemb'r 19th | 11 P. M. | 0.51 | D. N. | Near South Pole. |
| 1874 | Sun. | April 16th, | 8 A. M. | Total. | A. N. | Near South Pole, S. Africa. |
| " | Moon. | May 1st, | 11 A. M. | 0.83 | D. N. | China, Australia. |
| " | Sun. | October 10th, | 5 A. M. | Ann. | D. N. | Western Siberia. |
| " | Moon. | October 25th, | 2 A. M. | 1.05 | A. N. | United States. |
| 1875 | Sun. | April 6th, | 1 A M. | Total. | A. N. | Cape Good Hope, S. China |
| " | Sun. | Septemb'r 29th | 8 A. M. | Ann. | D. N. | New York, South Africa. |
| 1876 | Moon. | March 10th, | 1 A. M. | 0.30 | D. N. | United States. [land. |
| " | Sun. | March 25th, | 4 P. M. | Ann. | A. N. | Sandwich Islands, Green- |
| " | Moon. | September 3d | 4 P. M. | 0.35 | A. N. | Europe, Africa. |
| " | Sun. | Septemb'r 17th | 5 P. M. | Total. | D. N. | New Guinea, Cape Horn. |
| 1877 | Moon. | February 27th | 2 P. M. | 1.67 | D. N. | Persia, Indian Ocean. |
| " | Sun. | March 14th, | 11 P. M. | 0.30 | A. N. | Northeastern Europe. |
| " | Sun. | August 8th, | 11 P. M. | 0.39 | D. N. | Russian America. |
| " | Moon. | August 23d, | 6 P. M. | 1.76 | A. N. | London, Guinea. |
| " | Sun. | September 7th | 9 A. M. | 0.64 | D. N. | Southwest of Cape Horn. |
| 1878 | Sun. | February 2d, | 3 A. M. | Ann. | A. N. | South Pole, Tasmania. |
| " | Moon. | February 17th | 6 A. M. | 0.84 | D. N. | Pacific Ocean. |
| " | Sun. | July 29th, | 4 P. M. | Total. | D. N. | Behring Straits, Cuba. |
| " | Moon. | August 12th, | 7 P. M. | 0.60 | A. N. | London, Guinea. |
| 1879 | Sun. | January 22d, | 7 A. M. | Ann. | A. N. | La Plata, South Africa. |
| " | Sun. | July 19th, | 4 A. M. | Ann | D. N. | Guinea, Australia. |
| " | Moon. | Decemb'r 28th | 11 A. M. | 0.16 | D. N. | China, Australia. |
| 1880 | Sun. | January 11th, | 6 P. M. | Total. | A. N. | Ladrone Islands, California |
| " | Moon. | June 22d, | 9 A. M. | 1.07 | A. N. | China Australia. |
| " | Sun. | July 7th, | 8 A. M. | Ann. | D. N. | South Atlantic. |
| " | Sun. | December 1st, | 10 P. M. | 0.04 | A. N. | Southeast of Cape Horn. |
| " | Moon. | Decemb'r 16th | 10 A. M. | 1.39 | D. N. | China, Australia. |
| " | Sun. | December 31st | 9 A. M. | 0.71 | A. N. | Greenland. |
| 1881 | Sun. | May 27th, | 7 P. M. | 0.74 | D. N. | All round North Pole. |
| " | Moon. | June 12th, | 2 A. M. | 1.36 | A. N. | United States. |
| " | Sun. | Novemb'r 20th | Midnight. | Ann. | A. N. | Central near South Pole. |
| " | Moon. | December 5th | Noon. | 0.98 | D. N. | Siberia, Indian Ocean. |
| 1882 | Sun. | May 16th, | 3 A. M. | Total. | D. N. | Guinea, Persia, China. |
| " | Sun. | Novemb'r 10th | 6 P. M. | Ann. | A. N. | New Guinea Ils., Easter Ils. |
| 1883 | Moon. | April 22d, | Noon. | 0.09 | A. N. | Siberia, Indian Ocean. |
| " | Sun. | May 6th, | 5 P. M. | Total. | D. N. | Near Sidney, near Lima. |
| " | Moon. | October 16th, | 2 A. M. | 0.28 | D. N. | United States. |

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|---|---|---|---|---|---|---|
| 1883 | Sun. | October 30th, | 7 P. M. | Ann. | A. N. | Japan, Hawaii. |
| 1884 | Sun. | March 27th, | 2 A. M. | 0.14 | D. N. | Spitzbergen. |
| " | Moon. | April 10th, | 7 A. M. | 1.44 | A. N. | New Zealand, Aleutian Ils. |
| " | Sun. | April 24th, | 10 A. M. | 0.75 | D. N. | South Atlantic. |
| " | Moon. | October 4th, | 5 P. M. | 1.53 | D. N. | Eastern Europe, Africa. |
| " | Sun. | October 18th, | 7 P. M. | 0.64 | A. N. | Behring Strait. |
| 1885 | Sun. | March 16th, | 1 P. M. | Ann. | D. N. | California, Greenland. |
| " | Moon. | March 30th, | Noon. | 0.89 | A. N. | China, Sumatra. |
| " | Sun. | September 8th | 4 P. M. | Total. | A. N. | N. Zealand, S. of C. Horn. |
| " | Moon. | Septemb'r 24th | 3 A. M. | 0.79 | D. N. | Eastern Pacific. |
| 1886 | Sun. | March 5th, | 5 P. M. | Ann. | D. N. | Torres St., Gulf of Mexico. |
| " | Sun. | August 29th, | 8 A. M. | Total. | A. N. | Honduras, South Africa. |
| 1887 | Moon. | February 8th, | 5 A. M. | 0.4 | A. N. | Pacific Ocean. |
| " | Sun. | February 22d, | 3 P. M. | Ann. | D. N | South Pacific. |
| " | Moon. | August 3d, | 4 P. M. | 0.4 | D. N. | Europe, Africa. |
| " | Sun. | August 19th, | 1 A. M. | Total. | A. N. | Norway, North Pacific. |
| 1888 | Moon. | January 28th, | 6 P. M. | 1.2 | A. N. | Germany, Sahara. |
| " | Sun. | February 11th | 5 P. M. | 0.5 | D. N. | Near South Pole. |
| " | Sun. | July 9th, | 2 A. M. | 0.6 | A. N. | South Indian Ocean. |
| " | Moon. | July 23d, | 1 A. M. | 1.0 | D. N. | United States. |
| " | Sun. | August 7th, | 1 P. M. | 0.1 | A. N. | Western Siberia. |
| 1889 | Sun. | January 1st, | 3 P. M. | Total. | D. N. | Behring Strait, Hudson Bay |
| " | Moon. | January 16th, | Midnight. | 0.7 | A. N. | United States. |
| " | Sun. | June 28th, | 4 A. M. | Ann. | A. N. | S. Africa, S. Indian Ocean. |
| " | Moon. | July 12th, | 4 P. M. | 0.5 | D. N. | E. Europe, Madagascar. |
| " | Sun. | December 22d | 8 A. M. | Total. | D. N. | Venezuela, Abyssinia. |
| 1890 | Moon. | June 3d, | 2 A. M. | 0.1 | D. N. | United States. [Pegu. |
| " | Sun. | June 17th, | 5 A. M. | Ann. | A. N. | Cape Verd Ils., Smyrna, |
| " | Sun. | Decemb'r 11th | 10 P. M. | Ann. | D. N. | Mauritius, N. Z., Tahiti. |
| 1891 | Moon. | May 23d, | 2 P. M. | 1.3 | D. N. | China, Australia. [Russia. |
| " | Sun. | June 6th, | 11 A. M. | Tot'l(?) | A. N. | Russian Am., North Pole, |
| " | Moon. | Novemb'r 15th | 7 P. M. | 1.4 | A. N. | England, Guinea. |
| " | Sun. | December 1st, | 7 A. M. | 0.5 | D. N. | South of Cape Good Hope. |
| 1892 | Sun. | April 26th, | 5 P. M. | Total. | A. N. | South Pacific. |
| " | Moon. | May 11th, | 6 P. M. | 0.9 | D. N. | Germany, Ethiopia. |
| " | Sun. | October 20th, | 1 P. M. | Ann. | D. N. | Greenland. |
| " | Moon. | November 4th | 11 A. M. | 1.0 | A. N. | China, Java. |
| 1893 | Sun. | April 16th, | 9 A. M. | Total. | A. N. | Easter Ils., Guiana, Egypt. |
| " | Sun. | October 9th, | 4 P. M. | Ann. | D. N. | Sandwich Island, Peru. |
| 1894 | Moon. | March 21st, | 9 A. M. | 0.2 | D. N. | Japan, Australia. |
| " | Sun. | April 5th, | 11 P. M. | Ann. | A. N. | Egypt, China, Pacific. |
| " | Moon. | Septemb'r 14th | 11 P. M. | 0.2 | A. N. | United States. |
| " | Sun. | Septemb'r 28th | Midnight. | Total. | D. N. | Madagascar, New Zealand. |
| 1895 | Moon. | March 10th, | 10 P. M. | 1.6 | D. N. | Maine, South America. |
| " | Sun. | March 26th, | 5 A. M. | 0.4 | A. N. | Northern Europe and Asia. |
| " | Sun. | August 20th, | 7 A. M. | 0.3 | D. N. | Siberia. |
| " | Moon. | September 4th | 1 A. M. | 1.5 | A. N. | United States. |

| YEAR. | | DATE. | TIME. | MAGNITUDE. | NODE. | WHERE VISIBLE. |
|---|---|---|---|---|---|---|
| 1895 | Sun. | Septemb'r 18th | 5 P. M. | 0.7 | D. N. | South of Australia. |
| 1896 | Sun. | February 13th | 11 A. M. | Ann. | A. N. | Extreme South Atlantic. |
| " | Moon. | February 28th | 2 P. M. | 0.8 | D. N. | Turkestan, Indian Ocean. |
| " | Sun. | August 8th, | Midnight. | Total. | D. N. | West Siberia, Ladrone Ils. |
| " | Moon. | August 23d, | 2 A. M. | 0.7 | A. N. | United States. |
| 1897 | Sun. | February 1st, | 3 P. M. | Ann. | A. N. | New Caledonia, Guiana. |
| " | Sun. | July 29th, | 11 A. M. | Ann. | D. N. | Galapagos, South Africa. |
| 1898 | Moon. | January 7th, | 7 P. M. | 0.1 | D. N. | England, Guinea. |
| " | Sun. | January 22d, | 3 A. M. | Total. | A. N. | Fezzan, Socotra, N. China. |
| " | Moon. | July 3d, | 4 P. M. | 0.9 | A. N. | Russia, Madagascar. |
| " | Sun. | July 18th, | 3 P. M | Ann. | D. N. | South America. |
| " | Sun. | Decemb'r 13th | 7 A. M. | 0.02 | A. N. | Southwest of Cape Horn. |
| " | Moon. | Decemb'r 27th | 6 P. M. | 1.3 | D. N. | Germany, Ethiopia. |
| 1899 | Sun. | January 11th, | 6 P. M. | 0.7 | A. N. | Russian America. |
| " | Sun. | June 8th, | 3 A. M. | 0.7 | D. N. | North Europe, North Asia. |
| " | Moon. | June 23th, | 10 A. M. | 1.5 | A. N. | Japan, Australia. |
| " | Sun. | December 2d, | 8 A. M. | Ann. | A. N. | Central South Pole. |
| " | Moon. | Decemb'r 16th | 8 P. M. | 0.96 | D. N. | Eastern Atlantic. |
| 1900 | Sun. | May 28th, | 10 A. M. | Total. | D. N. | Mexico, Azores, Egypt. |
| " | Sun. | Novemb'r 22d | 2 A. M. | Ann. | A. N. | Guinea, South Australia. |

# EXPLORATION.

## THE ARCTIC RELIEF EXPEDITION OF 1883.

The following are the instructions of Gen. Hazen, the Chief Signal Officer, to Lieut. E. A. Garlington, who is to command the Arctic relief expedition to Lady Franklin Bay:

You are aware of the necessity of reaching Lieut. A. W. Greely and his party with the expedition of this year. The necessity cannot be overestimated, as Lieut. Greely's supplies will be exhausted during the coming fall, and unless the relief ship can reach him he will be forced with his party to retreat southward by land before the winter sets in. Such a retreat will involve hardship, and the probable abandonment of much valuable public property, with possible loss of important records and life.

For these and other reasons which will occur to you, no effort must be spared to push the vessel through to Lady Franklin Bay.

In the event of being obstructed by ice in Smith Sound or Kennedy Channel, you are advised to trv to find a passage along the west coast, which, besides

being usually the most practicable, will afford better advantages for sighting and communicating with any party sent out by Lieut. Greely. To make communication surer, your party must be able to readily send and receive messages by flag or heliograph and other means, and the necessary articles should be kept in readiness for instant use when communication is possible.

Should the vessel be unable to get through the ice to Lady Franklin Bay or to reach the west coast at points above Cape Sabine, it will be of great importance that Lieut. Greely should know of the efforts being made to relieve him, and of the plans for doing so. You will endeavor, therefore, to convey such intelligence, and omit no means of informing him or any of his party of the situation. Should any landings be made at prominent points on either coast during the efforts to get through the ice, you will leave a short record of the facts, with such information as it is desirable to convey, so deposited and marked as to render it discoverable by parties traveling southward. If such landings be made at points where caches of provisions are located, you will, if possible, examine them, and replace any damaged articles of food, leaving of course a record of your action.

If it should become clearly apparent that the vessel cannot be pushed through, you will retreat from your advanced position and land your party and stores at or near Lifeboat Cove, discharge the relief vessel with orders to return to St. Johns, N. F., and prepare for remaining with your party until relieved next year. As soon as possible after landing, or in case your vessel becomes unavoidably frozen up in the ice pack, you will endeavor to communicate with Lieut. Greely by taking personal charge of a party of the most experienced and hardy men equipped for sledging, carrying such stores as practicable to Cape Sabine, whence a smaller party, more lightly equipped, still headed by yourself, will push as far north as possible, or until Lieut. Greely's party is met. In this and other matters you will follow closely the instructions of Lieut. Greely dated August 17, 1881, a printed copy of which is furnished you herewith.

The men not employed in the expeditions will lose no time in preparing the house for the whole party and in securing the stores preparatory to the arrival of Lieut. Greely.

You will be furnished with two observers and an outfit of scientific apparatus and will be guided in their use by instructions herewith. The character and amount of the meteorological and other scientific work to be accomplished by your party is enumerated in inclosed memoranda.

In addition to the medical officer, enlisted men, and Mr. Beebe, taken from this city, you will employ three hardy ice men at St. Johns, who have been already selected by the United States Consul there under my directions, and in Greenland such Esquimaux as you may require.

It is important that a careful and complete record of events should be made, and in case your party does not return this year that a full report be sent by the vessel on her return to St. Johns. Each member of your party will be required to keep a private diary, which will be open to the inspection of the Chief Signal Officer only in case it should be necessary.

Whenever a junction is effected with Lieut. Greely you will report to him with your party for duty.

Should any important records or instruments have been left behind by Lieut. Greely in his retreat they may be recovered by the steamer to be sent in 1884.

It is believed that with the stores and supplies sent last year, which are at St. Johns, N. F., and at the Greenland ports, a list of which is herewith furnished, and which you will gather on your way northward, together with the provisions and articles supplied this year, everything needful will have been furnished for safety and success. I believe and expect that you will zealously endeavor to effect the object of the expedition, which is to succeed in relieving your comrades, since upon your efforts their lives may depend, and you cannot overestimate the gravity of the work intrusted to your charge.

A ship of the United States Navy, the Yantic, will accompany you as far as Littleton Island, rendering you such aid as may become necessary and as may be determined by the captain of that ship and yourself when on the spot.

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## NORDENSKJOLD'S THEORY.

Professor Nordenskjold sailed yesterday from Gothenburg on his tenth Arctic expedition. He was born in Finland just fifty years ago. Half his lifetime has been spent in Arctic exploration or in making preparations for it.

The Sofia, which has been lent by the Swedish Government, is a small steamer, carefully fitted for the work she has to do, which is not specially dangerous. None of the Vega staff accompany their old leader to Greenland, though science is well represented on board the Sofia. Nordenskjold is supported by Dr. Nathorst as geologist and paleontologist, Herr Kolthoff for birds and insects, Dr. Hamberg as hydrographer, Dr. Berlin as surgeon and naturalist in general, and Herr Forsstrand as preserver of specimens. As ice-master one of the boldest Norwegian skippers has been selected, Johanesen, who in his walrus schooner has sailed far beyond the north point of Novaya Zemlya. The crew consists of twenty-four men.

His main object is to penetrate into the heart of Greenland, in order to test his theory that the permanent ice is really only a band surrounding the interior, which in summer, at least, is literally a land of greenery. In this trying journey Nordenskjold will be accompanied by at least one of his staff and ten of his crew, and will be equipped with all the appliances requisite for ice-travelling. In providing this equipment he has been guided not only by the experience of Alpine climbers, but by the knowledge he acquired twelve years ago, when in company with Palander, he succeeded in penetrating thirty miles inland from the head of Auleitsivik Fjord, his starting point in the present expedition. About thirty or forty miles from the coast the interior seems to rise suddenly like a huge wall of ice, cleft here and there, fortunately, by valleys, by means of which the expedition will be able to reach the uneven plateau of the interior. The first forty

miles are likely to be the most trying; the coast region is cut up by gaping crevices and broad rivers in the midst of rugged hills of ice, and these will necessitate long *detours*. The rivers, as a rule, terminate in magnificent waterfalls, which plunge suddenly into what seem to be bottomless abysses of ice. In his former journey Nordenskjold attained a height of about 2,000 feet, and east and north the country seemed to rise gradually, and presented the appearance of a billowy sea suddenly frozen. Auleitsivik Fjord, from which the expedition will start on its journeys, opens just below Disco Island, and penetrates a considerable distance into the land. At this point Greenland is about its broadest, so that the line of exploration has been well chosen to test the theory which has prompted the expedition. This theory was no new one on the part of Nordenskjold, for as long ago as his former expedition in 1870 he seems to have come to the conclusion that Heber's "icy mountains" were confined to the regions of the Greenland coast, surrounding a land comparatively free from ice, and even wooden in its southern parts. If Nordenskjold succeeds in confirming his hypothesis it will be one of the triumphs of science.

It will be after the return from this inland journey, probably in the early part of September, that the expedition will make an attempt to land on the southeast coast to search for remains of the old Norse colonies founded here 900 years ago. While the Danes were harrying the coasts of Saxon England, eighty years before William the Norman landed at Pevensey, Red Erik, outlawed in Iceland, set out to seek the land which Gunbjorn had seen far to the westward 100 years earlier. This land he found, and made it his home, and colonized it with his kinsmen and friends, who reared their villages and farm-houses and churches over a great stretch of the southwest coast. At their most flourishing period these old Norse colonies probably numbered 10,000 inhabitants. Even in Red Erik's time adventurous spirits sailed still further west, and planted outlying settlements on the shores of Vinland, Helluland and Markland; the first Europeans probably who set foot on a land on which centuries later their kinsmen were to rear one of the greatest nations on the face of the earth. For the old Norse Vinland was in all probability the modern Massachusetts, while Markland and Helluland have been identified with Nova Scotia, Newfoundland and perhaps Labrador. It seems strange that spirits so enterprising and adventurous, the countrymen of the Vikings who kept Europe in terror, from the Orkneys to the Mediterranean, who mastered England, and ultimately gave her a dynasty and an aristocracy, should have let these momentous discoveries pass into oblivion, should have finally turned their backs upon a land of unbounded promise and settled down in contentment on the ice-bound shores of Greenland. The truth is that the Norsemen at home never seem to have realized the vast importance of the discoveries of their venturesome kinsmen, and although, as we have said, the population increased to 10,000, the communication with Iceland and Norway soon became fitful, and after the fourteenth century we hear little of them.

We have, however, a brief written in 1448 by the Pope to the Bishop of Norway, treating of the pitiful condition of the inhabitants of Greenland, who,

thirty years before, had been attacked by the hostile fleet, which carried off people of both sexes into captivity. With much plausibility, these invaders are conjectured to have come from the British Islands. By the latter half of the fifteenth century all communication with the mother country had ceased, and when John Davis rediscovered Greenland in 1585 no other but Esquimaux people were found anywhere on the coast. Traditions, however, still exist among the Greenlanders as to the first white visitors, and from these and the Sagas it is evident that latterly frequent collisions took place with the natives, and the probability is that the remnant of the colonists was absorbed by the Esquimaux. Bishops of Greenland still continued to be appointed down to the sixteenth century, but these never made any efforts to reach their diocese. As we have said, Nordenskjold maintains, contrary to the received opinion, that the remains of Osterbygd, much the larger settlement, are to be found to the east of Cape Farewell; whether he is right or wrong, any addition to our knowledge of the condition and fate of these premature colonizers of America will be welcome.—*London Times.*

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# GEOLOGY AND MINERALOGY.

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## THE PHENOMENA OF METALLIFEROUS DEPOSITS.

PROF. JOSEPH LE CONTE.

The following is an abstract of a paper read before the American Academy of Sciences at its late meeting in Washington, which in the author's absence was read by Prof. T. Sterry Hunt:

The paper said that the phenomena of metalliferous deposit by solfatusic action at Sulphur Bank and Steamboat Springs have tended strongly to confirm what he had previously believed to be the most probable theory of vein formation, and at the same time time to give it more clearness and definiteness. The structure, the mode of occurrence and the contents of metalliferous veins leave no longer any room for doubt that they have been formed by deposit from solutions. If any doubt had lingered on this subject it was thoroughly dissipated by the phenomena of deposit still in progress at Sulphur Bank and at Steamboat Springs. Among the metallic ores cinnabar has long been considered a possible exception to this mode of deposit. The extreme volatility of this sulphide, the extreme irregularity of its veins, and its frequent occurrence in the vicinity of comparatively recent volcanic action have suggested that it may have been deposited in irregular fissures, cracks, cavities, etc., by condensation of its vapors sublimed by volcanic heat beneath. But the phenomena of Sulphur Bank and Steamboat Springs ought to settle the question forever. Cinnabar as well as other metallic

sulphides are now being deposited there, along with silica, from solution. Admitting, then, as established the view that metalliferous veins have been deposited from solutions, the most difficult questions still remain: What are the conditions under which deposit takes place? and what, in addition to simple water, have been the solvents?

In answering the first question it must be remembered that the chemistry of nature is far more subtle and refined that that of the laboratory; that substances which are regarded as practically insoluble in the latter cannot be so regarded in the former. The infinite patience of nature and the infinite slowness of her operations must be taken into account. In the perpetual circulation of subterranean waters infinitesimal deposits, continued and accumulated through almost infinite time, produce large results. Thus mineral veins may be composed of substances of extremest insolubility, and yet be deposited from solutions. In fact, such extreme insolubility, or at least very feeble solubility, would seem to be a condition of mineral vein formation, for otherwise the minerals would be in most cases brought to the surface instead of being deposited below.

Again, it must be borne in mind that solubility, even the feeblest, is notably increased by heat, especially super-heat, and by pressure. The latter is generally regarded only as a necessary condition of super heat and not as itself an active agent. But in fact pressure acts directly as an active agent in increasing the solubility of nearly all substances. Mr. Sorby has not only proven this by actual experiment on a great variety of substances, but has shown that it is a necessary consequence and beautiful illustration of the law of correlation and conservation of natural forces, and that we have in this as in the case of fusibility an example of the equivalency of mechanism and molecular forces. For, as in the matter of fusibility in all cases in which expansion takes place in fusion, pressure by resisting expansion raises the fusing point, while only in those exceptional cases like ice, in which contraction takes place in fusion, pressure by arresting contraction lowers the fusing point. So also in the matter of solubility, in all cases in which contraction takes place in solution, namely, in which the volume of the solution is less than the combined volumes of constituents, pressure by arresting contraction increases solubility, while only in very exceptional cases as, for example, sal ammoniac, in which expansion takes place in solution, pressure by resisting expansion diminishes solubility. These latter cases are so extremely rare that we may assume as a law the increased solvent power of water in proportion to pressure. It is even possible by experiment thus to determine the mechanical equivalent of the chemical force of solution of any given substance; and, in fact, this has been so determined for several substances by Mr. Sorby. There can be no doubt, then, that the solvent power of water may be increased without limit by corresponding increase of heat and pressure. It is quite certain, therefore, that water deep in the interior of the earth, especially in volcanic regions, and therefore under heavy pressure and super-heat, would have its solvent power greatly increased, not only by the super-heat but also by the pressure. It is believed that few substances could resist entirely its solvent power. Such waters, coming

up slowly toward the surface through fissures, large and small, would have their solvent power diminished both by cooling and by relief of pressure, and must of necessity deposit in their courses and form mineral viens. But the solvent power of subterraneous waters is still further very greatly increased for most vein matters by the pressure of alkali in the form of alkaline carbonates or alkaline sulphides, or both. This is especially true of the commonest of vein stuffs, viz : quartz and lime carbonate, and the commonest forms of metallic ore, viz.: metallic suphides. The solubility of silica in alkaline carbonated waters is well known, and with excess of carbonic acid in the waters all the earthy and metallic carbonates are also soluble. The solubility of many and probably of all metallic sulphides in alkaline sulphides, especially with excess of hydrogen sulphide under pressure and super-heat, can no longer be doubted; for iron sulphide and mercuric sulphide are now being deposited from such waters, both at Sulphur Bank and at Steamboat Springs.

Mr. Christy and others have proved the solubility of mercuric sulphide under pressure and super-heat by actual experiment; and these are among the most insoluble of metallic sulphides. It is certain, then, that metallic sulphides are soluble to a limited extent in alkaline sulphides, forming doubtless double sulphides. It is certain, also, that the solubility is increased by super-heat and pressure. It is therefore also certain that hot waters containing alkaline carbonates and alkaline sulphides, circulating at great depth and therefore under heavy pressure, would take up silica, earthy and metallic carbonates and metallic sulphides, and that coming up slowly toward the surface they would deposit these substances in their courses, partly by cooling and partly by relief of pressure, and thus form metalliferous veins. Cooling and relief of pressure are the most useful causes of deposit, but not the only ones. Organic matters are of almost universal occurrence in subterranean waters, and their agency in reducing metallic oxides and metallic salts is well known. Organic matter is a universal reducing agent.

The acids of organic decomposition may prove a reducing agent. Such in brief is an outline of a true theory of the genesis of metalliferous viens—a theory apparently confirmed by the study of causes now in operation at Sulphur Bank and Steamboat Springs, and probably many other places in California and Nevada.

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## COMPARATIVE VALUE OF DIFFERENT COALS.

General M. C. Meigs has lately issued a pamphlet in which he shows the results of experiments made under his direction to determine the caloric value of different varieties of coal. This has in it so much that is valuable that we condense from it what we consider very interesting data. The experiments include thirty-one different kinds of coal. Nearly all the varieties were American, some English and Scotch. These experiments were carried out to determine the rela-

tive value of different coals supplied to the United States army for fuel, and the equivalent value of the same coal as compared with cords of oak wood, and have every appearance of having been carefully and faithfully carried out. The measure of value is the quantity of water evaporated from and at 212° F. per pound of coal. The experiments in question were with an improved vertical water tube boiler designed by General Meigs, and built for this express purpose. The data given below are all from experiments with this boiler. It is only a portion of the whole experiment.

Semi-bituminous coal, Somerset County, Penn., 88.99 per cent of combustible, 9.85 pounds of water; semi-bituminous of another grade, from the same county, 90.92 per cent of combustible, 97.5 pounds of water; Wilkesbarre anthracite from Black Diamond mine, 80.77 per cent of combustible, 9.37 evaporation; Scranton anthracite to D. & H. C. Co., 77.3 per cent combustible, 9.28 pounds water; Lykens Valley anthracite, 93.87 per cent combustible, 9.07 pounds water; Los Cerrillos anthracite, New Mexico, 88.25 per cent combustible, 9.04 pounds water; Scranton anthracite D. L. & W. R. R. Co., 82.85 per cent combustible, 8.87 pounds water; bituminous coal near Pittsburg, 94.04 per cent combustible, 8.78 pounds water; Los Cerrillos, bituminous, New Mexico, 86.74 per cent combustible, 8.60 pounds water; West Virginia splint, 91.9 per cent combustible, 8.34 pounds water; Scotch splint from Glasgow, Scotland, 93.28 per cent combustible, 7.61 pounds water; Davison, West Hartley, 94.01 per cent combustible, 7.6 pounds water; South Wellington, Vancouver's Island, 91.83 per cent combustible, 7 59 pounds water; Cow Pen, West Hartley, England, 93.89 per cent combustible, 7.52 pounds water; Indiana cannel coal, Davis County, Indiana, 75.18 per cent combutible, 7.32 pounds water; Wellington coal, Wellington mine, Vancouver's Island, 90.62 per cent combustible, 6.71 pounds water; bituminous coal Cañon City, Colorado, 90 per cent combustible, 6.45 pounds water; Eastport, Coos Bay, Oregon, 91.16 per cent combustible, 5.24 pounds water; Weber coal, Chalk Creek, Summit County, Utah, 89.98 per cent combustible, 4.73 pounds water; lignite coal, from Dakota, 93,77 per cent combustible, 4.03 pounds water.

In the first specimen of coal, 1521 pounds was equivalent to a cord of oak wood; the last named required 3712 pounds of coal as the equivalent of one cord of oak wood, and the variation was constant; beginning with the first item, at 1521, a continual progression is made, showing that each coal that follows was less and less in value both in evaporative efficiency and in real efficiency as compared with oak wood. There is also another very important point which the users of coal will profit by studying. The percentage of combustible in coal is no index whatever of the evaporative efficiency of the coal in the same boiler. The percentage of combustible has been one of the points about which theoretical engineers have had immense arguments; immense, perhaps, in their prolixity, vague in meaning, entirely indefinite and indeterminate. As an actual fact, which General Meigs has settled most effectually, the semi-bituminous coal proves to be the most valuable, and while the percentage of combustible in the first item

is considerably less than that of the last item mentioned, we have an evaporative efficiency of about 225 per cent as compared with the last item, so that if the lignite coal cost $4 a ton, the semi-bituminous coal would be cheaper at $9 a ton for the quantity of water evaporated, which is the true and only actual measure of value in a ton of coal. So far as we know, no individual experiment was ever tried to demonstrate the particular factor, and men buy coal just as they buy nails or sand—so much a load or so much a ton—thinking, perhaps, that bituminous coal at one price is cheaper than anthracite at another, while if the various brands of coal in the market should be carefully and honestly tested, it might be found that certain grades of anthracite coal at $7 a ton were cheaper than another grade of anthracite coal at $5 a ton if anything short of bulk for bulk was to be considered. These experiments are very valuable if steam users will only heed them.—*Cotton, Wool and Iron.*

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## THE TRINIDAD COAL MINES.

ISAAC T. GOODNOW.

We were now coming east, on a beautiful afternoon, just in the right mood for enjoying the scenery. The railroad very nearly follows the old Santa Fe trail, and also the present well traveled wagon-road over the Raton Mountains, whose fantastic peaks tower right and left to the skies, with openings occasionally to the north that enable us to see, low down in the horizon, the famous Spanish Peaks, one hundred miles away, a wonderful demonstration of the purity of the atmosphere. Just before leaving New Mexico, the train suddenly plunges into a tunnel 2100 feet under the highest crest of the Raton Pass, and on emerging we find ourselves inhaling the pure air and enjoying the bright mellow sunshine of a Colorado day. The highest point of the Raton Pass is 7861 feet, and of the tunnel 7688 feet, a height of 173 feet saved by the tunnel. On leaving this we pass the Devil's Cañon, and in five miles reach the foot of the pass at the little station of Morley; farther on four miles we find Starkville, a sort of suburb to Trinidad, and the site of a remarkable coal mine, stopping an hour and a half to examine it.

The veins of coal are horizontal, and from nine to fourteen feet thick; no finer bituminous coal can be found. This mine has been worked steadily one and a half years, and yields three hundred tons a day, and ninety tons of coke. This is made by heating the coal in ovens to a red heat, and driving off the water and gases. One hundred pounds of coal will make fifty-five pounds of coke, which is nearly pure carbon. Forty-two ovens are in operation here; one hundred and fifty-five men are employed, nine hours constituting a day's work. Laborers outside are paid $2 per day; inside, $3; for mining coal, sixty cents per ton is paid. The laborers are Americans, Swedes, Italians, and Mexicans. We entered the mine on the east side of the mountain by a tunnel six to eight feet

wide, and perhaps twelve feet wide, coal above, below, and on both sides, glistening from our little lamps like black diamonds, and generally constituting a self-supporting roof. We penetrated in a straight shute 1400 feet, finding openings to the right and left, with occasional doors to regulate the draft of air which is supplied by fans on the outside driven by steam-power. Turning to the left some fifty feet, we found what appeared to be a small engine with a horizonta cylinder, made so as to drag along the ground, and working a drill horizontally[1] The machine is really operated by compressed air forced into the mine through iron pipes, which are connected with the machine by flexible rubber tubes. This machine is placed at the end of the tunnel and is moved by hand from one side to the other at the bottom, and by its effective action cuts to pieces a thin layer of coal under the great mass at the end of the tunnel; two holes, twelve feet apart, near the top of the mine, are bored and cartridges inserted, and the mass of coal at the end of the passage way is blown off, several tons at a blast; quite an improvement on the old pick. Everything is systematized and moves like clock-work.

Friday, May 18th, 4 o'clock P. M., finds us at Trinidad, the guests of its enterprising and hospitable citizens. With an elegant array of carriages we were met at the depot and driven over the city, and those who wished went to the Engle coal mine, three and a half miles away. At the mouth of the mine, at the west and south, we found a comfortable little mining town of some five hundred inhabitants, representing the usual nationalities. The coal beds, three in number, usually crop out near ravines, are easy of access, and are naturally drained. The beds are horizontal, no shafting or hoisting is necessary, there is no dampness or bad air, as in most mines. These veins are parallel, varying in thickness from six to fourteen feet. The middle one is worked the most; the roof of this is light-colored sandstone, and sufficiently strong to sustain itself, consequently saving all expense in blocking. Never before have I seen such a rare combination of circumstances to produce first-class coal with so little labor, so little inconvenience to health and life to work the same. We notice here the mouths of two other tunnels, one opening into a mountain on the north and the other into a mountain on the east, both the mountains joined together at the base. The north tunnel runs clear through the mountain and also connects with the east tunnel. The magnitude of the work may be realized when it is understood that there are twenty-six miles of underground railway in this mine.

Two hundred and seventy men and boys are here employed, and the amount of coal produced each day is one thousand tons; its cost of production is sixty-two and a half cents per ton; this includes interest on investment, wear and tear of machinery, weighers' and superintendent's salary. Coal sells at the mine at one dollar and a half per ton, leaving eighty seven and a half cents profit. On one thousand tons, the product of this mine per day, yields $875, or $319,375 per year, a very fair profit. Coke sells here at $5 per ton, though formerly brought from Pittsburgh at $25 per ton. To produce coke costs $2 per ton, leaving a profit of $3 per ton; two hundred and fifty ovens will produce

three hundred and twelve and a half tons each day, or a net profit of $93,740 per year. After a general survey of the outside, some twenty of us, with the Hon. E. J. Morrill, M. C., than whom a better traveling companion never existed, with lamps in hands, took our seats in some half dozen coal cars, drawn by three fine looking mules. At the crack of the whip, we plunged into the earth, every face glowing with expectation and excitement. The similarity of the Starkville mine renders a description of this unnecessary; they both belong to the same great system of coal measures underlying this portion of the Raton Mountains and comprising an area of one thousand square miles. How far we penetrated I can only guess, probably three-quarters of a mile; here we left the cars, and walking a short distance, found a new machine, operated by the same motive power as the machine described in the Starkville mine; this has been used about two years and is an improvement upon that.

This machine instead of having the drill of the other machine, has an iron roller four feet long and two and one-half inches in diameter, armed with projecting teeth. This, when pressed against the bottom of the coal at the end of the tunnel, by revolving rapidly cuts away the foundation of the great body to the thickness of the rollers two and a half inches, four feet wide and projecting under the coal some five feet; when one breadth is cut, the machine is moved one side to another cutting, till the whole mass of coal at the end of the tunnel, some twenty feet across and five feet in width is undermined. Tho holes two and a half inches in diameter and twelve feet apart near the top of the mine are then bored six feet in depth, and a pound cartridge inserted in each. The joint explosion throws off some twenty tons of coal. Only two of these are used in the mine. The old pick still plays an important part. A shout of "all aboard," and we are speedily in our little cars and Jehu with a flourish of his whip sets our faithful animals upon a jump till we find ourselves again upon the outside of the earth.

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# THEOLOGY.

## PÈRE HYACINTHE AND CATHOLICISM.

E. R. KNOWLES.

Reverend Charles Loyson, well known to us as Père Hyacinthe, was born at Orleans, in France, March 10th, 1827, was ordained a priest of the Catholic Church in 1846, and, after being a professor of theology for six years, became in 1859 a Carmelite monk. He soon became a preacher of note, and his power and influence as a preacher increased till, just previous to the Roman Vatican Council of 1870, he had become "the most famous modern preacher of the

world." After the Vatican Council he, like the old Catholics in Germany, refused to receive the decrees of the Vatican Council as dogmas of Catholic faith, and proceeded gradually to reach the theological position which he has since held.

Few Americans, outside of the American Church, understand the theological position of the Gallican Church, which Père Hyacinthe represents. It has been and is, greatly misunderstood, and, because of misunderstanding, as greatly misrepresented. It is my intention here, then, without considering any proofs as to what councils of the Church have, or have not, been Ecumenical, or as to what are, and what are not, the recognized authorities of the Universal Church, and without claiming correctness or incorrectness for the definitions below given on which the nomenclature which I am obliged to use for the sake of clearness is based, to merely state and explain as briefly as possible the theological position of Père Hyacinthe.

He says in one of his published Munich discourses: "Three great principles, or, if you prefer the expression, three great methods, in our time, are disputing among themselves the empire of the soul—Rationalism, Protestantism, Catholicism. Rationalism suppresses Revelation. * * * * * Protestantism maintains Revelation, but mutilates it; and in effect, while extolling the Bible, separates it from the living tradition which is its complement and explanation, and substitutes the individual faith of the Christian for the collective faith of the Church. Catholicism alone abides faithful to the whole revelation, written and spoken—spoken before it was written, and so written, I repeat, that it ever stands in need of being completed and illustrated by speech; only this speech is not that of an individual conscience, of an isolated person, but the universal and constant teaching of the Church—in those masterly words of Vincent of Lerins, 'what has been believed by all, always, everywhere.' *Quod semper, quod ubique, quod ab omnibus.* Doubtless the faith of the intelligent Catholic is profoundly personal, but it has for its basis and its guide the collective faith of the church." In this sense Père Hyacinthe is like all Catholics throughout the world, who do not add Papism or Infallibilism to their Catholicism, neither Protestant nor Romanist, but a Catholic. Essentially the faith of the Gallican Church is the same as that of all Catholics throughout the world who regard as Ecumenical Councils only those which were held in the east during the first eight centuries and before the separation between the eastern and western halves of the church, and who go back for the symbol of their faith to primitive Christianity and confirm their faith by the text of unversality, permanence, and consent, and the decrees of Ecumenical Councils. St. Vincent of Lerins, in the year 434, write his "Commonitory" against heretics, of which a Romanist writer declares that "no controversial book ever expressed so much and such deep sense in so few words." (Gahan's History of the Church, p. 192.) In this book he lays down this fundamental principle, that only such doctrine is truly Catholic as has been believed "in all places, at all times, and by all the faithful." Such is the Catholicism of the Greek, English, and Anglo-American Churches,

the old Catholics of Germany, and the Gallican Mission Church, all portions of the Universal Church, in harmony with each other regarding all points of doctrine which they consider as essential, and constituting what may properly be called the constitutional party of the Catholic Church. And while there is no logical standpoint between absolute submission to the decrees of the constituted authorities of the Catholic Church and complete separation from it, it is yet necessary to first be sure what are the lawful authorities of the Church, and whether the Pope is the Catholic head of the Universal Church, or the *Roman* head of the *Roman*-Catholic Church. The Catholic recognizes as Catholic doctrine only such as has been believed by all the faithful, always and everywhere. The *Roman*-Catholic or Papist, holds that the Roman Pontiff is the supreme, infallible, visible head of the whole Christian Church. Because of the prerogative of infallibilty no General Councils of the Church are necessary to ascertain what has been believed in the Church of all lands and ages. "It is enough to interrogate the oracle that speaks at the Vatican."

The position of the German old Catholics, and of Père Hyacinthe is logically unassailable. They apply to their faith the Catholic test of universality, permanence and consent, not recognizing that the Pope of Rome has any right to force upon Catholic Christendom the reception of non-Catholic doctrine, and do not allow that it is possible for them to be cut off from the Catholic Church by any excommunication by the Pope, on the ground that he has no authority to excommunicate them. They say of the Roman Church as did St. Cyprian of the Novatians: "We did not depart from them, but they departed from us;" claiming not that they are the only Catholics, but that such Catholics as I have above mentioned as recognizing as truly Catholic only such doctrine as will stand the test of universality, permanence and consent, are the only Catholics faithful to the methods and traditions of the Church.

Père Hyacinthe's theological position will be better understood in proportion as Catholics insist upon unity only in essentials. The true Catholic spirit sounds forth in those words of his,

"I am not afraid; the truth will conquer!"

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# ARCHÆOLOGY.

## THE GLACIAL PERIOD IN ILLINIOS.

At a recent meeting of the St. Louis Academy of Science, Mr. William McAdams was introduced and invited to exhibit some rare specimens he had excavated in various parts of Illinois. The gentleman, in explaining his specimens, with the view of throwing as much light as possible on the subject, read the following paper:

"The last great convulsion of nature, under the guidance of an all-wise Providence, ended the geological epoch and finished the earth, leaving it in its present outward form, which is called by geologists the quaternary or drift period. During this period the earth, from some cause not easily explained, became covered toward the poles, with an enormous envelope of ice, which after a time, from causes also obscure, melted and moved toward the equator, eroding away the upheaved prominences and filling up the valleys with clay and other debris that in the end left a great area of the country, especially in the Mississippi valley, with the general level surface upon which the rich soil of this great region reposes.

"The deposits of the drift, as seen in digging wells and making other excavations, as well as in the precipitous exposures made by water-courses, consist usually of a reddish brown clay, underlaid by a bluish plastic clay lying on the surface of the rock, which is usually reached in both Illinois and Missouri at a depth of less than one hundred feet. This depth, however, is sometimes exceeded where the valleys of ancient streams are met with.

"Mingled with these drift-clays are many boulders and masses of rocks of great interest from the fact that they are often of different material from any rocks we have in place in Illinois. It is quite common to find granite, porphyry, greenstone and other primary rocks that have evidently come from the region of Lake Superior. It is not uncommon to find masses of native copper, doubtless from the same northern locality. The present specimens of this copper are from the drift in the neighborhood of Alton and near Grafton. It is quite probable that a period of many years elapsed—ages, in fact—during the subsidence of the drift-glaciers; and although it may not be quite certainly ascertained that man beheld the phenomena of this epoch, it is quite certain that many strange animals braved the rigors of the climate and evidently flourished. Some of these animals were of strange appearance, and where their bones are discovered protruding from the clays, one is astonished at their size. From the clay in the side of a ravine in Calhoun Co., Illinois, we recovered the jaw of an elephant beside which Jumbo would seem small. One of the teeth from this fossil jaw, and which we present for inspection, weighs near eighteen pounds, being much lighter in its fossil state than when in the mouth of the living animal. The teeth of this great glacial elephant are quite different and much larger than those of the mastodon which also existed during the same period. The teeth of this extinct elephant very much resemble the teeth of the elephant of the present day. We have also taken from the drift-clays above Alton the teeth and several bones of a huge carnivorous animal allied to the bison, probably the extinct *Bos latifrons*, the spread of whose horns would make those of a Texas steer seem very small in size.

"It is quite probably that during this period more than one species of horse existed. Bones of extinct horses are quite numerous in the tertiary deposits about the base of the Rocky Mountains.

"In digging a well in Greene Co., Illinois, the workmen found at the bottom of the excavation the teeth of an extinct horse somewhat resembling those of the present day. We also have seen the fossil tooth of a horse from near Alton.

All the remains of the horse we have seen from the 'drift' are of large animals, while the majority of the fossil horses from the 'bad lands' of Dakota are quite small.

"Along the banks of the Mississippi the character of the 'drift' deposits is somewhat changed by a sort of lacustrine marly clay left during the slow subsidence of the waters down the river valley after the ice had melted away. This marly clay deposit which caps the river bluffs is called loess and passes gradually into the drift clays below. It is somewhat remarkable that with the many fluviatile shells and remains of land animals in the loess we also occasionally find the the remains of animals almost wholly marine. From the loess above Alton a few years ago was recovered the skull of a species of walrus with curved tusks down from the upper jaw and much resembling the walrus now inhabiting the Arctic seas. From the clays over the quarries at the mouth of the Illinois River we have taken the remains of a large and undescribed animal that had apparently curved tusks depending from the upper jaw, not unlike the walrus. These tusks were some three feet in length, the smooth surface of the ivory being raised longitudinally in fluted parallel lines, quite unlike the tusk of any known animal. We present portions of these tusks for inspection. Both in the true and modified drift we have seen the remains of rodents, some of them small; but one, an extinct beaver, was of monstrous size. Some of these animals, from the fact that their remains have been found in the mire of swamps, survived the drift period and became extinct in later periods. This is especially true of the mastodon. As little as is known of the animals of this period, still less is known of the vegetation. We also present specimens of wood from the same horizon.

"At one locality on Otter Creek, in Jersey Co., Illinois, the stream cutting through an ancient valley filled with drift-clays, there is exposed beneath the drift-clays a pre-glacial soil near four feet in thickness. In this curious deposit wood and other vegetation are numerous. A tree lies prone in this soil, with parts of the limbs still attached. The trunk of the tree, of which we present a section, with portions of the limbs adhering, is flattened and almost turned to lignite by pressure and lapse of time. But what is still more interesting are the cones or fruit which the tree bore. These cones are about an inch in length and somewhat resemble those of a species of conifer, different, however, from any known species. We place before you other remains of this ancient vegetation."

Judge Holmes in commenting upon the specimens stated that marine deposits had been found in a peculiar stratum which was supposed by geologists to extend as far south as the mouth of the Ohio River and that the tusks referred to in the paper would be a valuable discovery if they proved to be those of a walrus.—*Globe-Democrat.*

## TOLTEC ANTIQUITIES.

The Smithsonian Institution has received an invaluable addition to its rare collections. This addition consists of the widely advertised plaster casts of Central America antiquities, contributed to the Institution by Mr. Pierre Lorrillard. These casts include many wonderful monuments of antiquity existing in the ruined cities of Central America, reproducing with absolute fidelity, and in their actual size the extraordinary bas-reliefs and hieroglyphic inscriptions of the ancient temples of Yucatan, Tubasco and other regions in Mexico and Central America. The relics have been fully described in the magazines and daily papers of the country. They arrived in charge of M. Barbier, the agent of M. Desire Charnay, the distinguished French archæologist, who resurrected the antiquities. The collection is packed in eleven boxes, which are now stored in one of the grand halls of the institution. Mr. Barbier unpacked the valuables, and estimates that the placing of them in proper order and position will require two months, There are about one hundred models altogether.

Professor Baird said to a *Republican* reporter that the gift was a most welcome one. M. Charnay had gone out to Central America several years ago under the patronage of M. Pierre Lorillard. Under the laws of the ancient countries explored by him, he was prohibited from bringing any of his discoveries away, being permitted only to casts of them. These casts were first shipped to Paris, where copies were made for the French government, M. Charnay's arrangment with Mr. Lorillard including that privilege. The casts were then shipped to this country. M. Charnay could not come in person to deliver the models, but has sent M. Barbier, a noted artist and modeler of Paris.—*National Republican.*

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## CLIFF-DWELLERS OF COLORADO AND NEW MEXICO.

FLORA ELLICE STEVENS.

Last winter Colonel James Stephenson, who is well known as an archæologist, made some interesting discoveries in exploring the cliff-dwellings on the southern boundaries of Colorado and New Mexico.

Colonel Stephenson is connected with the Bureau of Ethnology and an enthusiast in pursuit of discoveries. He found in his work several mummies which were wrapped in cloth made of a fabric resembling flax, and in one of the dwellings specimens of the reed entire, from which it is probable that the fabric may be exactly defined.

Colonel Stephenson thinks that the cliff-dwellers were still in existence as late as three centuries ago, much later than archæologists have generally determined; and in defense of this theory cites a Spanish author, who visited this

country three hundred years ago, and who describes a people living in this locality, whose cloth and other articles tallies with that found by Colonel Stephenson, which is a very important point indeed.

DENVER, COLO., July 22, 1883.

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# PHILOSOPHY.

## THE NATURE OF THE EXISTENCE OF MATTER.

E. R. KNOWLES.

"We feel but the pulse of that viewless hand
Which ever has been and still shall be,
In the stellar orb and the grain of sand,
Through Nature's endless paternity."

Philosophers are now obliged to refer all the phenomena of the universe to the action of a substance occupying space, which communicates light, heat, electricity, and gravitation from one body to another, and mental emotion and imaginary ideas from one mind to another. This omnipresent medium is called *Etherium*, or *the ether*. Most scientific men are fully convinced of its reality. It is a necessary inference from the following facts:

1. The planets "influence each other," and are all attracted by the Sun.

2. Philosophers agree that the atmosphere does not extend more than two hundred miles from the Earth's surface.

3. Heat, light, electricity, magnetism, and gravitation operate in an exhausted receiver just as well as elsewhere

4. One mind sometimes influences another independently of ordinary sensation or muscular motion, without contact or perceptible connection.

Says Professor Tyndall, "The domain in which this motion of light is carried on lies entirely beyond the reach of our senses. The waves of light require a medium for their formation and propagation, but we cannot see, or feel, or taste, or smell this medium. How, then, has its existence been established? By showing that by the assumption of this wonderful intangible *ether* all the phenomena of optics are accounted for with a fullness and clearness and conclusiveness which leave no desire of the intellect unfulfilled. When the law of gravitation first suggested itself to the mind of Newton, what did he do? He set himself to examine whether it accounted for all the facts. He determined the courses of the planets; he calculated the rapidity of the Moon's fall toward the earth; he considered the precession of the equinoxes, the ebb and flow of the tides, and found all explained by the law of gravitation. He therefore regarded this law as

established, and the verdict of science subsequently confirmed his conclusion. On similar, and if possible, on stronger grounds, we found our belief in the existence of the universal ether. It explains facts far more various and complicated than those on which Newton based his law. If a single phenomenon could be pointed out which the ether is proved incompetent to explain, we should have to give it up; but no such phenomenon has ever been pointed out. It is, therefore, at least as certain that space is filled with a medium by means of which suns and stars diffuse their radiant power as that it is traversed by that force which holds, not only our planetary system, but the immeasurable heavens themselves in its grasp." And again, "The ether which conveys the pulses of light and heat not only fills the celestial space, bathing the sides of suns and planets, but it also encircles the atoms of which these suns and planets are composed. It is the motion of these atoms, and not that of any sensible parts of bodies that the ether conveys; it is this motion that constitutes the objective cause of what in our sensations are light and heat." Again he says, "Two atoms of oxygen and one of sulphur constitute the molecule of sulphurous acid. Now it has been recently shown, in a great number of instances, that waves of ether issuing from a strong source, such as the Sun or the electric light, are competent to shake asunder the atoms of gaseous molecules. A chemist would call this 'decomposition' by light, but it behooves us who are examining the power and function of the imagination, to keep before us the physical images which underlie our terms. Therefore, I say, sharply and definitely, that the components of the molecules of sulphurous acid are shaken asunder by the ether waves. * * * * * * * * * Here, then, our ether-waves untie the bond of chemical affinity, and liberate a body—sulphur—which at ordinary temperatures is a solid, and which therefore soon becomes an object of the senses." To other modifications of ethereal action are referable muscular motion, sensation, and all the other phenomena of the material universe.

Says Professor J. Stanley Grimes, "Light cannot penetrate boards and stone walls, but magnetic force can do so; for a magnet affects iron-filings through such obstacles, almost as if there was nothing in the way; and so also does gravitation. It is plain that if we could perceive through the medium of this magnetic force instead of light, we could see through boards and walls as easily as the magnet operates through them; for the magnet operates in the dark just as well as in the light. We must conclude, therefore, from the great number of facts which we have upon this subject, that there is a motion of Etherium, different from light, by means of which the force of gravitation is communicated; and another modification of etherean motion, by means of which magnetism penetrates through opaque bodies. It, therefore, requires no stretch of the imagination to admit a modification of ethereal force which affects the brain and its organs, and produces Consciousness and Clairvoyance in a subject who is, by the process of etherean induction, brought into communication with it. If we analyze a sunbeam, we can demonstrate that besides light and heat it contains another kind or motion of Etherium, different from light and heat, which produces powerful chemical effects

and yet we have no senses given to us by which to enable us to perceive by its means, though it may sometimes abnormally induct us and produce clairvoyant perception."

"It seems to me, that there cannot be a doubt in the mind of a philosopher who examines the subject carefully, that there is a peculiar form or modification of ethereal force, which has, with some propriety, been denominated *Animal Magnetism*, and which is concerned in producing all the phenomena of animal life, and all the wonders of Etheropathy and Mesmerism. We seem forced to this conclusion as the only one which will account for facts which we are not able to controvert."

It is well known that orators often exercise a so-called magnetic influence over their hearers. It has been proved that mesmeric susceptibility is owing neither to the imagination, nor the credulity, nor the nervousness of the subject, and that when a subject is in a state of etheropathic sympathy, produced by induction, ideas can be communicated from the mind of the operator to that of the subject, and the subject made to act by the mere silent will of the operator, without any indication being given to the subject by the word, look, or act of any one as what the operator has in mind[1]. These last mentioned facts have led some scientific men to suppose this ether to be homogeneous with, or at least intimately connected with, that immaterial, simple substance, the soul.

The idea that the will of man can direct ethereal action in such a way as to produce etheropathy, or mesmerism, is perfectly consistent with the nature of the will. In the case of the electric eel, we have an instance of the will directing electricity in such a way as to paralyze the limbs of animals at a great distance, and even to produce death.

If, then, the electric eel can habitually and instinctively direct by its will *one* modification of ethereal action, it is reasonable to suppose that the will of man can direct *another.*

In view of the facts herein already adduced, the only way whereby to account for certain incontrovertible facts is to refer matter, as well as light, electricity, etc., to the immaterial substance called the ether. All the difficulties with which philosophers now meet in explaining various phenomena by the action of the ether, arise from their not explaining the very existence of matter by ethereal action.

"That which truly is, or essence," is the proper meaning of substance. *Substance* is "the ultimate point in analyzing the complex idea of any object. *Accident* denotes all those ideals which the analysis excludes as not belonging to the mere being or nature of the object."

1 "If we proceed still farther, we gradually, in many subjects, acquire a power of moving their organs by merely willing, and without expressing our will by any sign; but, in these cases though neither assertion nor sign is necessary to influence the subject, yet an assertion, if made, is wonderfully potent."—(Grimes' Etherology, etc., p. 149.) "Let us now consider, that when a subject is perfectly inducted, the mere silently expressed *will* of the operator can influence him, and cause him to move or feel in any desired way. No assertion in this case is necessary—no sound—no sign—no external muscular motion. There is nothing but the operation of the silent but potent will.—(Ibid., p. 147.)

The substance of all matter is the ether, this "creating and informing spirit, which is with us and not of us." The accidents of any object are its peculiar modifications of ethereal action.

The ether acts in space, directed and compelled in its action by the Divine Will. There are:

1. Simple modifications of ethereal action.
2. Combinations of such modifications.

The accidents of objects are constantly sustained by the Divine Will in accordance with fixed and permanent laws. This theory explains the phenomena of matter by the action of the ether; but it teaches neither that the ultimate reason of all movement is a force primitively communicated at creation, a force which is everywhere present in all bodies, but differently limited; nor that any such force is inherent in the ether; nor yet that force is transmitted through the ether. I hold that the Divine Will constantly sustains by sympathetic induction all the modifications of ethereal action which constitute matter.

At any point in space the ether is constantly governed by the Divine Will in such a way that an object there situated, has a real existence *there*, whether any one is there to perceive it or not, its real existence being a combination of certain modifications of ethereal action; and the same object is presented to every spirit who happens to come or be brought into communication with that point in space, this presentation being governed by fixed laws, and any one who has already perceived a particular object knows that upon going again to the place where it is, the same object will be perceived by him, *i. e.*, the same combination of modification of ethereal action will be communicated to his soul by means of this same ether as a medium and by certain other modifications, and combinations of modifications, of ethereal action.

Our perception, therefore, of real ideas or material objects is the result of the action of the Divine Will on our minds, and the Eternal Spirit constantly sustains and presents these real ideas for the contemplation of created spirits, but they exist out of the minds which perceive them.

This theory does not merge the creature in the Creator; and does not make God the agent or power in everything that is done, and thereby lead us to the same point with Hume, viz.: that the mind is but a mere series of impressions, and that we can have no knowledge of it.

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## THE SCIENTIFIC STUDY OF HUMAN NATURE IN SCHOOLS.

C. A. SHAW.

I once, in conversation with a superintendent of schools, suggested that a text-book of human nature be introduced. He wearily replied that the list of studies was now so great that mastery of any one was impossible, and that to introduce a few more would make the varnish of public instruction so thin that

it would not bear the least scratch of practical experience. "Superficial information is the bane of this country," said he.

The answer to his complaint did not immediately occur to me, or rather, I did not at once group all my arguments against his assertion in a sufficiently connected manner to think it wise to take up his valuable time by presenting them at that moment. Since then I have considered the subject and venture to present my views as follows:

There is, I think, a wide difference between knowing of things and knowing the things themselves; also, of knowing about things and about the uses of things, —that is people. It seems to me a superficial knowledge of a good many things is not such a bad education; for example, when a lad from the country first comes to the city he is hopelessly confused; he loses his way; he is ignorant of prices; of articles he requires; of the means of obtaining them, and of the proper place for seeking instruction. His ignorance is not that of capacity but of locality. He is not like a man to whom music is a sealed art, having neither taste nor instruction, neither is he like a man skilled in one profession who, late in life, is forced to attempt another for which he has neither aptitude nor training, for in these instances nothing derogatory to the person is implied. But we all ridicule the simple-minded who cannot readily group and use for their benefit the thousand appliances of civilized life with which we are surrounded. It denotes, we think, a want of that adaptiveness which in practical life is the most valuable attribute for success. A student, by diligent application, may become a profound Grecian, but in how few instances will his thoroughness avail against the annoying intricacies which the adaptive man so readily escapes.

I do not wish to imply that this superficial knowledge of common forms is a matter of very great importance, but it is certainly worth considering as an element of a man's life.

It frequently happens that to know men is better than to know things. It would not answer if nobody was to be learned, or wise, or thorough. But it is one of the peculiarities of the human brain that one boy will learn easily one thing and not another, and that culture consists in training those faculties which the youth is naturally disinclined to use. The study of human nature would be quite unnecessary if all in the school intended to become commercial travellers. They learn the lesson soon enough. They are obliged to do so and if by commerce with the world of tradesmen that congregate at hotels they learn too thoroughly an objectionable side of human nature, yet to them it is possibly only the extreme of adaptiveness which we lament the lack of in a student who, perhaps, has a profound knowledge of ferns and does not know one man from another.

It may be asked what text-books could be advantageously employed? Well, they would have to be written, that is certain. I do not incline to the phrenological chart. It too frequently happens that a man inherits the external presence of a progenitor without his ability. He is walking about and masquerading in another man's dress. I do not say but that a practiced scientific phrenologist could readily detect the imposture. They pretend to do things much more

surprising. But the art I would first inculcate upon youthful minds would be easy matters of every-day application. I think briefly something like this might be shown.

First: that youth is self-confident (for a very good reason, since without confidence little will be attempted,) but that in itself this does not imply special capacity.

Second: that success breeds confidence, for what a man has done once he believes he can do again.

Third: that a certain discipline of the physical, mental, and spiritual faculties breeds a calm confidence that is eminently fitted to ensure success.

For this discipline of the nerves I think music and playing upon some musical instrument, billiards, firing a pistol or rifle, riding or travelling greatly assists the body in attaining and retaining, and a student of any sedentary occupation should seek such contrasting influence. I do not advise military drill, for I do not like the sort of men that usually seem to be the result of military education, but that may be a personal prejudice or the result of special training in a narrow field. A martinet is only more objectionable in a military role as he is hedged about by greater power of authority. Thoughtful educators have advocated military tactics as very valuable.

The result of failures might be shown to be not always discouraging. A man must learn to do his best work in the field best adapted to his powers. It is no hardship for a young man to fail as a lawyer if thereby he is induced to give his time and talents to a pursuit for which he is better adapted. Failure should be shown to rest upon character and not upon circumstance.

The cause of failure, however, such as resulting from lack of nerve, either from physical disability, ill health, old age, etc., should be made evident, and also that sucess in one line naturally debars a man from success in another. Even the great Goethe was once heard to lament that "he lacked the cheek of the bagman of his day." But not every one aspires to the complete many-sidedness which was Goethe's affliction. Too frequently the novelist points out that the wise minister, or student, or teacher, is little better than an idiot "because he is not up" in all the little ways of the great world. But this is a mistake. A man after his first youth can afford to dress according to comfort more than to fashion and if, when a boy, he has looked at the world from the practical side and found nothing very alluring therein, if in middle life he finds it full as pleasant to be "off the stage," as on, he is thereby not to be classed as a "fossil" and a "country guy." There is a wide difference between "having known and out-grown" and "never having known." The latter always rests upon a weakening desire to experience it. It is this state of mind which sends so many good men staggering when by chance they get a little unwonted liberty late in life, and which ruins so many young men too tightly kept in restraint when boys. There is not much in civilized life that is tempting to the experienced, but who can convince the inexperienced of this?

I know that the student of the humanities makes nearly the same plea that I

have made and against the sciences. But I would retain the scientific basis of study even in this new walk. For the scientific way, at least by its classified regimen, shows its narrowness upon its face. These being known can be corrected.

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## A SCIENTIFIC INVESTIGATION OF SPIRITUALISM.

Some time since Mr. Henry M. Seibert endowed the chair of moral and intellectual philosophy in the University of Pennsylvania, with a request or provision that the trustees should appoint a commission from the faculty to investigate what is known as spiritualism. The trustees have, within a short time past, acted upon the bequest and made the appointments. The commission consists of Dr. William Pepper as chairman, who is the provost of the university, a gentleman of acknowledged scientific attainments. The other members are Prof. George A. Koenig, Ph. D., assistant professor of chemistry, and a graduate of Heidelberg; the Rev. Robert E. Thompson, A. M., professor of social sciences; Joseph Leidy, M. D. LL.D., professor of anatomy, and the Rev. George W. Fullerton, instructor. The commission will be divided into branches, and members assigned to them in accordance with their experiences and qualifications. Dr. Pepper will have charge of the medical and physiological phases of the subject; Professors Leidy and Koenig, the physical aspects; Rev. Dr. Fullerton and Rev. Dr. Thompson, the intellectual and metaphysical phenomena. Mr. Seibert was a firm believer in spiritualism, yet it is understood that all of the members of the commission are non-believers. Few people, unless they have given attention to the matter, have any correct idea of the number of persons who have embraced this belief. The spiritualists claim a million of believers in the United States, and as many more in Europe. It is well to have an investigation by scientific men. It can do no harm, and may do a great deal of good.

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## THE TENDENCY OF SCIENTIFIC INQUIRY.

At the Annual Meeting of the Victoria Philosophical Institute, held at London, England, in the last week in June, the Honorary Secretary, Captain F. Petrie, F. R. S. L., read the yearly report, by which it appeared that the Institute—founded to investigate all questions of Philosophy and Science, and more especially any alleged to militate against the truth of Revelation—had now risen to 1,020 members, of whom about one-third were foreign, colonial, and American, and new applications to join were constantly coming in. An increasing number of leading men of science had joined its ranks, and men of science, whether in its ranks or not, co-operated in its work. During the session a careful analysis had been undertaken by Professor Stokes, F. R. S., Sir J. R. Bennett, Vice-

President R. S., Professor Beale, F. R. S., and others, of the various theories of Evolution, and it was reported that, as yet, no scientific evidence had been met with giving countenance to the theory that man had been evolved from a lower order in animals; and Professor Virchow had declared that there was a complete absence of any fossil type of a lower stage in the development of man; and that any positive advance in the province of prehistoric anthropology has actually removed us further from proofs of such connection, namely—with the rest of the animal kingdom. In this, Professor Barrande, the great palæontologist, had concurred, declaring that in none of his investigations had he found any one fossil species develop into another. In fact, it would seem that no scientific man had yet discovered a link between man and the ape, between fish and frog, or between the vertebrate and the invertebrate animals; further, there was no evidence of any one species, fossil or other, losing its peculiar characteristics to acquire new ones belonging to other species; for instance, however similar the dog to the wolf, there was no connecting link, and among extinct species the same was the case; there was no gradual passage from one to another. Moreover, the first animals that existed on the earth were by no means to be considered as inferior or degraded. Among other investigations, one into the truth of the argument from Design in Nature had been carried on, and had hitherto tended to fully confirm that doctrine. The question of the Assyrian inscriptions and the recent Babylonian researches had been under the leadership of Mr. Hormuzd Rassam, who, on his arrival from Nineveh, had given a full report of the extent of his new excavations, which were of the highest interest. His discovery of Sepharvaim, one of the first cities mentioned in Holy Writ, was most important. Professor Delitsch and others aided in the consideration of the discoveries and the inscriptions found. Two meetings had been held to consider the questions raised in Herbert Spencer's Philosophy, and Lord O'Neill and others had shown, by a careful analysis of his arguments, that a greater attention to accuracy in statement would have kept Mr. Spencer from arriving at those hasty conclusions which had made his philosophy remarkable. It was announced that the results of explorations now being carried on in Egypt would be laid before the Institute early in the winter. The discoveries were very important, especially that of the site of Succoth, which, like the results of the survey of Palestine, was confirmatory of the Sacred Record. The quarterly journal, which had been published for sixteen years, was now issued free to all Members and Associates, whether at home or abroad.

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We are glad see the evidences of prosperity which are presented by the American *Naturalist.* The first half of the seventeenth volume contains over seven hundred pages, more that in some of the whole volumes of previous years. Illustrations are not used so freely as in the past.

# ENGINEERING.

## OF FRESHETS AND OVERFLOWS.

REV. ALBERT E. WELLS.

We Americans are an inventive people and stand ready to grapple with any problem that comes in the way of our developing the vast country that is our inheritance. Permit then, in view of the annual devastation wrought by water, a suggestion in regard to the proper method and place of meeting and guiding the waterfall or catch of the Mississippi basin. Is there not bad contrivance, to say the least of it, in trying to handle its enormous bulk along the lines of river border in Louisiana? If I wished to direct the water falling upon the roof of a barn I would catch it as near the roof as possible, and not wait to have it mingled with the rain falling on all the farm. The proper place, therefore, to deal with the overflows that do so much damage from Omaha, St. Paul, and Pittsburg to New Orleans, is on the upper watersheds. A tub that will not hold water is a failure for a tub. Competent engineering could, I believe, make every town in this vast area hold water at least long enough to deliver it in proper shape to the watercourses that lie next below. And every town would be the better for doing so.

Consider for a moment the present system of natural open drains. They waste land, by the space they occupy, and by washing of their banks. If we start at the head of the draw, and follow down, we shall meet, first, the break in the sod or soil where the force of the water begins to cut. Second, a deepening ravine or gully where, the top soil being cut through, we find the clay washing out. Third, the rock formation is reached, and by the time we are three miles down the stream we have a cross section of some forty-five square feet and waste ground each side of it, sixty feet wide on an average.

Most of the time the bed of this watercourse is dry. After an ordinary shower it is bank-full, after a heavy rain it overflows its banks, and its turbid waters tear away its banks like flumes, and below there is for the larger stream a choked-up channel that puts it in a rage, and the washing out is on a larger scale until the river is reached where we have our yearly unmanageable torrent. And nine-mile creek has a bed large enough for a navigable river in which one is not likely three weeks after a heavy rain to find running water enough for his horse to drink, and drift beyond its banks sufficient to indicate the awful power of its flood. An examination of its bed shows piles of loose stone, sand-banks and mud-banks, stranded drifts of logs, trees, stumps, and straw, and corn-stalks. A calculation of the amount of water that has probably passed through the channel will serve to excite our wonder. Say the basin drained is a township of

irty-six sections. A three-inch rainfall has flooded the basin, and nothing of it now is seen save the wrecks it has made. A navigable river discharging 90,000 cubic feet an hour, should have at least a year's time to disgorge it, 80,301,860 cubic feet of water have rushed through that bed in ten or twelve days. The problem of handling this bulk is worthy of our greatest engineering talent. And the place for the most useful handling, and as well as the most successful, is the place where it falls.

1st. Fifty acres of water surface to every township is none too much and is less than is now wasted. The avoiding of open drains and of washing are items of considerable importance to farmers. The delivery of clean water to the larger rivers is one of considerable importance to river men, and the interests of navigation. A constant flow in all streams whose minimum and maximum are known is greatly desired by railroads that have to provide bridges, and culverts, to roadmasters who have to construct bridges and approaches to them for these streams. If the basin of any of the minor rivers in north Missouri were so dealt with that every township could deliver in catch-ponds its rainfall so that land should be ready for the plow ten or twelve hours sooner than at present, and not deliver to the streams in bulk this vast amount of water, it would be a gainer.

For instance, Grand River drains about 1,000 townships. It should be a navigable river, its bed is large enough from the mouth to the north line of the State. Its watershed provides water enough if the flow were regulated to afford a good pathway for steamboats of 100 tons displacement. If the entire basin were, under skillful engineering, drained and reservoirs so placed that every township should hold its catch at least sixty days before parting with the last of it, and then deliver no drift, it would add greatly to the safety, the utility and the beauty of that stream, and would save us the bar at its mouth in all probability. If all the streams in the vast basin under consideration were thus dealt with a great deal better success would attend our attempts to improve the navigation and protect the levees of the lower river. Now all this region is inhabited by intelligent and thrifty people, and the organization that has the most to do with it is the town meeting or the county board, the units of our commonwealth. Of course the engineering problem would be different in every locality, but not insuperable in any. For the data are given so nearly that the exact character of the work can be determined, when place and area are known. The fall for the year here averages forty-two inches, on the upper Mississippi it is forty, what it will be for any area is readily determined. We cannot ride ten miles from this city without crossing some one of these beds of streams that are miserable gullies and washes. And in this land at least, "The Brook" of Tennyson is unknown. The beautiful streams of the lake country of Wisconsin are not found here. May they not be made? Filling a narrow gorge or cañon with a seething mass of water, mud and drift does not add to the useful drainage of a country, while the filling of a lake, or pond, or tarn with pure water and guiding its surplus away through dewy meadows or shady forest, a living stream, to join some other

living stream and "so go on to join the brimming river" might add beauty to utility.

I love the water. Its beauty in the landscape. Its comfort in the land. The purposes of thrift that it serves. I cannot forget the enjoyment they give, in the land they make beautiful, those lakes of Wisconsin. Though they may not be reproduced here, yet our supply of water enables us to do a far better part by our land than we are doing now. I hope our civil engineers will take up the subject.

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## MEXICAN RAILWAYS.

There were 2,379½ miles of completed railways up to the end of April in Mexico. A few of the shorter ones are now worked by horse-power. The completed and partially completed roads are the Tiascala road, 2½ miles; the Orizaba Ingenio, 3 miles; the Nuetla-Tiasciaco, 4 miles; the San Adres, 7 miles; the Tialmanalco, 9 miles; Pueblo and Matamoras Izucar, 19 miles; San Martin, 23 miles; Tehuacan-Esperanza, 31 miles; Tehauntepec, 31 miles; Sinaloa and Durango, 36 miles; Vera Cruz-Medellin, 39 miles; Hidalgo, 56 miles; Pueblo San Marcos, 57 miles; Yucatan, 68 miles; Mexico-Tialpulalpam, 75 miles; Sonora, from Guaymas to Nogales, 234 miles; Inter-Oceanic, Mexico to Curantla and branches, 183 miles; Mexican National, Mexico to Acambaro, 178 miles; from Laredo Southward, 208 miles; branches, 87 miles; Mexican Central, Mexico to Lagos, 311 miles; Paso del Norte to Chihuahua, 302 miles; Tampico to San Louis Potosi, 62½ miles; Mexican, Vera Cruz to Mexico, 264 miles, and Pueblo and Jalapa, 89½ miles. Of these the Mexican National, the Inter-Oceanic, the Hidalgo, and the Yucatan lines are narrow gauge, the other lines are standard gauge.

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# CHEMISTRY AND PHYSICS.

## ANCIENT AND MODERN GLASS OF MURANO.

JAMES JACKSON JARVES.

Of all the peoples which have made glass a special industry, the Venetians, for artistic variety and quality, are the most renowned. The Egyptians, Phœnicians, Greeks, and Romans in certain kinds are unrivalled, especially in moulded, cut, mosaic, and cameo-glass, of which last the Portland and Neapolitan vases are unsurpassable specimens. With the Byzantines the art survived, but in a degenerate form, as with classical painting and sculpture. Nevertheless, there is little doubt that it was more or less extensively practised at Constantinople and in Italy during the Dark Ages, although so little information and so few speci-

mens of these times have reached us. In the form of mosaic it must have been extensively cultivated, at least from the fourth and fifth to the ninth and tenth centuries. We may be tolerably certain that the beginnings of the Venetian art came from Oriental and Byzantine sources. But there are no records relating to its glass previous to the twelfth century. In 1268 we have notices of scent bottles and table ware, and in 1275 the exportation of the materials used in the manufacture was prohibited. So rapidly did it grow into commercial importance that the State intervened to protect and encourage it in every possible way, and to make it a national monopoly. In this it succeeded so far that the fine manufactures of Venice controlled the markets of the known world for centuries; and although more or less successful attempts were made in other countries to become independent of her, none ever succeeded in equaling the variety, beauty, and refinement of the best Venetian work. The republic wisely ennobled the art, and in 1376 decreed that the descendants of glass-blowers who intermarried into the noble families should be considered as patricians. Particular civil privileges were conferred on the guild. It was not amenable to the inferior courts, but was under the special jurisdiction of the celebrated Council of Ten.

Although Venice itself gives its name to the glass as early as 1291, the works in general were removed by statute order from that city, and established in the neighboring island of Murano, a mile to the northeast, where there were already in existence manufactories, but on a smaller scale. This was to guard against the risk of fires in the thickly populated city, and for sanitary reasons. Henceforth Murano became the chief locality of this industry, which finally took such proportions that the street along the chief canal, more than a mile long, became mainly devoted to it. Coccio Sabellico, in his account of Venice, written about 1495, thus alludes to Murano:

"There is a street which might, from the magnificence and size of its edifices to those who beheld it from afar, appear a city; it extends a mile in length, and is illustrious on account of its glass-houses. A famous invention first proved that glass might feign the whiteness of crystal, and as the wits of men are active and not slothful in adding something to inventions, they soon began to turn the material into various colors and numberless forms. Hence came cups, beakers, tankards, caldrons, ewers, candlesticks, animals of every sort, horns, necklaces; hence all things that can delight mankind; hence whatever can attract the eyes of mortals; and, what we could hardly dare to hope for, there is no kind of precious stone which cannot be imitated by the industry of the glass-workers. Consider to whom it did occur to include in a little ball all the sorts of flowers which clothe the meadows in spring.[1] Nor has the invention been confined to one house or family; the street glows for the most part with furnaces of this kind."

This is a graphic description of the condition of the industry at Murano in latter part of the fifteenth centry, when it was bordering on its most artistic and flourishing period, in which it was a virtual monopoly of the Republic. Murano

[1] Referring to one kind of *Millefiori*—thousand flowers—glass, made from *canne*, or rods of many colors.

so eclipsed all other Italian cities that none other ever acquired any reputation for glass. There were sufficient reasons for this success. Its secret processes were jealously guarded, and the skill of the workmen in various departments kept, as it were, in certain families, and transmitted from generation to generation.

Among the most distinguished were the Berovieri, the Miotti, Briati, and Ballerini, some of whose descendants are still engaged in the same occupation in the new establishments of Salviati and the Venezia-Murano companies, reproducing and even rivalling the artistic dexterity of their ancestors. Their chief aim was to make *artistic* glass exclusively for beauty; and, secondly, to ornament and shape even the articles of common use so that they should, as Sabellico happily expresses it, "attract the eyes of mortals" and "delight mankind." This vital æsthetic principle of work was the real secret of the fame and success of Venetian glass, as of its painting. In making beauty, not utility, its governing rule, it demonstrated by its commercial success and enrichment of the State that the higher the aim of industrial art, the surer the road to fortune, as well as mental delight. It "paid" Venice amazingly well to give beauty its rightful place in manufactures, and be satisfied with nothing short of its fullest development. Besides seeking the best materials, and aiming at strength, delicacy, and lightness, which were promoted by not using lead, as is the general modern practice in glass, each manufactory so well kept its secrets that we now know very little of their modes of manufacture. The State lent its aid also in a series of Draconian enactments, which, if they did not wholly preclude competition in other places, mainly prevented it. Workmen who took their craft to foreign countries and refused to return were condemned to death, and secret emissaries were sent to execute the sentence. In 1549 it was enacted that workmen caught leaving the country should be fined and sent to the galleys, and that no foreigners be employed in the glass houses. If it were a cherished and lucrative business at home, under the eyes of the "Ten," it was equally made a most dangerous calling to be exercised by any Venetian abroad.

As early as 1500, there were twenty-four glass-houses at work at Murano, each having more or less its specialty The furnaces in general were small. During the period of its greatest prosperity—the fifteenth, sixteenth, and seventeenth centuries—Murano counted thirty thousand inhabitants—now reduced to about five thousand. Each owner of a factory was obliged to contribute annually a certain sum to a common fund for the succor of the unfortunate of their own class—poor and infirm artisans, or those out of employment, and for the maintenance of the schools of inventive design. No apprentice could be admitted as a master-workman before passing a strict examination in his art, and proving his skill in the manufacture of certain objects. The candidate was elected into the body of masters by their secret ballots. Each factory was subject to inspection night or day by certain officers, whose duty it was to see that the work was regular according to the statutes, to note the quantity and quality of the objects, and that no glass in fragments, or cullet, be exported. Proprietors, and master-work-

men of ten years' experience, if they honorably failed, and had no other means of subsistence, were entitled to pensions of seventy ducats annually. When there were more master-workmen than could be profitably employed, it was forbidden to increase their number from the apprentices untill there was a real call for new hands. Whoever became a member of the guild was obliged to take an oath of fidelity. No one who had not a regular discharge from his employer could be received into the service of another, and every proprietor was obliged to seal his cases with his own trade-mark. It was forbidden to employ strangers under any pretence. If there were not enough of the Muranese at times for labor, or to exercise the art, Venetians only might have the privilege, but they must be duly qualified. No employer could hire a master-workman who was in debt to another of the guild. Such were some of the regulations to keep the art in a high state of efficiency, and which for more than five centuries gave it an incontestable superiority in its special aim over all other establishments in Europe. In fine, Murano became as artistically famous for its glass as Urbino, Pesaro, Gubbio, or Chaffagiolo at the same time for their majolica, but with far greater commercial development.

Mr. Franks, somewhat incompletely but conveniently, so far as he goes, classifies the decorative glass as follows, in six divisions:

First. The transparent and colorless glass, or of single colors, commonly black, purple, blue, ruby, green, opalescent, amber, etc. Sometimes there are two colors in the body of the same vessel—one inside and the other on the outside. Frequently in the handles and external ornamentation a variety of colors twisted in light fantastic forms of extreme delicacy, or laid on in threads, is used, especially in drinking-vessels.

Second. The heavier Gothic or classical forms, originating in the fifteenth century, before the fashion changed to the extremely light and capricious shapes of the sixteenth, were profusely gilt and enamelled. As these processes required considerable strength of material, they were confined to the heavier objects, in the form of bowls, cups, tumblers, salt-cellars, nuptial and other gift goblets. The decorations consisted chiefly of pictorial scenes, such as processions, portraits, coats of arms, inscriptions, allegories, scroll and lace work, and various intricate designs: sometimes merely flowers, garlands, or flower-like ornamentation in gold, diversified with many dots in lines representing pearls and precious stones, or scale decorations. In later times, cups and dishes, instead of the more expensive and difficult enamelling, were painted on their under surfaces in oil-colors. As this form of glass requires not only great skill in its material preparation, but but equal artistic talent, and is liable to many accidents in the furnace, it was always expensive and not common. Good specimens of the ancient are very rare, and the finest valued at thousands of dollars each, especially those done by Berovier, of whose work the nuptial cup at the Correr Museum at Venice is a noteworthy example, of about A. D. 1450.

Third. In the sixteenth century, glass with a rough surface, as if frosted or frozen, called *crackled*, first came in vogue; also the kind incrusted with fragments.

of glass of different colors, giving great brilliancy of effect to the roughened surfaces.

Fourth. The kind now common, but expensive, known as aventurine glass, was first made in the seventeenth century. But before this the fashion of imitating stones had begun, as also the opaque, variegated, marbled glass, commonly known as *schmelz*. The old specimens of jasper, lapis lazuli, tortoise-shell, agate, onyx, chalcedony, and mixed colors, chiefly in shape of essence and tear bottles, vases, jars, jugs, urns, etc., are extremely well done, colors intense and harmonious; but the modern are fast rivalling them, although, as we shall see, as yet not equal to Miotti's brilliant chalcedony, with its transmitted ruby light inside, or the earlier, softer, and more diversified aventurine. The modern is of a uniform, tiresome, mechanical, even sparkle, with no relief of tint and shade.

Fifth. In the fifteenth century, or perhaps earlier, began the attempts to revive the varieties of the old Roman and Etruscan mosaic glass, or that known as the *millefiori*, or thousand flowers, which is made by the combinations of *canne*, or rods, in fusion and union of colors in divers patterns. The old Venetians were successful, but not the extent of quite equalling the taste and beauty displayed by the Romans in this line of art.

Sixth. The Venetians, however, surpassed the ancients in lace or reticulated and filigree glass—*vetro di trina, reticelle, filigrana*, and the milk-white (*latticinio*) varieties, in the manipulation of which they acquired great skill.

These divisions by no means include every species of work done by the old Venetians in this material. As early as the fifteenth century we have specimens of elaborate architectural compositions, like temples or tabernacles, and of cabinets, coffers, altars, crucifixes, and other objects of the most diversified, quaint, ornate, and complicated character, constructed of glass. Not only these, but statuettes and groups of figures in enamelled glass, beautifully modelled, were fashioned; mirrors, frames, lamps, candelabra, beads and chandeliers of costly elegance and variety of ornamentation also were largely produced, not to mention the grotesque and picturesque shapes given to articles of common use. In the seventeenth century, engraving with the diamond point began to be practised, generally in delicate lace pattern. The famous Giuseppe Briati in the next century successfully imitated the German and Bohemian cut and engraved glass to a certain extent, and was renowned for his glass-framed mirrors and chandeliers, ornamented in intaglio, and with foliage, fruits, and flowers. He revived also the best forms of the sixteenth century, especially the filigree and lace glass, with equal lightness and brilliancy, while his glass was of superior purity and clearness. His works were so much admired as to be put on a par at entertainments with the gold and silver plate. He died in 1772. With him passed away the best period of glass-making. Subsequently its forms became heavy and rococo. The fall of the Republic gave the death-blow to the industry, which virtually became a lost art until 1838, when Signori Bupolin, Bigaglia, Tosi, Radis, and others sought to re-establish it, with, however, but indifferent success.

It was not until 1864 that any serious attempt with sufficient capital was

made to revive the artistic manufacture of glass at Murano on its ancient scale. Assisted by several English gentlemen, Dr. Salviati formed his first company for this purpose, which, after becoming successfully established, divided into two—that which now goes by his name, and the Venezia-Murano Company, under the auspices of Sir Henry Layard and Sir William Drake, Signor Castellani being the able director.

These companies had in reality to begin anew, and feel their way backward to the old artistic forms and skill. The first effort was toward a revival of the ancient feeling for graceful, elegant, and varied form, without which the superior technical processes and chemistry of the nineteenth century would have been unavailing. Both companies have made extraordinary progress, as the exposition at Milan of 1881 of Italian industrial art clearly showed. Each has succeeded in its blown glass, in imitation of or in direct copying the best examples of the exquisite forms of the sixteenth century, in infusing it with the essential life or soul without which all art is dumb, and which speaks so eloquently in the ancient glass. With a substance that time acts on so slowly in the best examples, it is not easy to discriminate between the originals and copies. In general, however, the modern workman has yet something to learn in lightness and evenness and solidity of touch, in graceful tournure, and in those almost intangible qualities in art which come from long experience and enthusiastic passion. He has not yet wholly emancipated himself from the *rôle* of mere copyist. But the old genius of the Italian race for artistic invention begins to manifest itself. New forms and designs are rapidly coming into existence, rivaling in dexterity and beauty the old. I speak only of the real artistic objects made with a view of displaying the utmost skill of their best artists.

The beautiful covered chalice of the Salviati Company done by Leopoldo Bearzotti, as a specimen of exquisite enamelling and original design, is a masterpiece. His copies of the Correr nuptial cup, and the famous Byzantine tazza in the treasury of San Marco, and other old pieces, leave something to desire in the completeness of their technical execution after the antique manner. It is said that eighty thousand francs has been offered for the little San Marco tazza. In the Venezia-Murano exhibition there is to be seen a copy, of the exact size of the original, done by Edwin Benvizzi for Sir William Drake, and mounted in the same manner, which cost four thousand francs, so like it that apart it is not easily to be taken as a copy. But the chief specialty of the Venezia-Murano Company is their successful reproductions of the famous antique murrhine glass, mentioned by Pliny, in imitation of fluor-spars, gems, and precious stones of transparent colors, in the form of cut and polished cups, bowls, and dishes. The old Venetians, so far as we know, did not attempt to do this on any large scale. They are costly to execute, the great bowl at the exposition being priced at five thousand francs. It is twelve and a half inches in diameter, of one piece of interblended amber and turquoise colors, and is the largest ever made. There were only two made. The uncut one I secured, and it is in the New York museum. The artist who made it says it is even richer in color than the one shown at Milan.

Smaller pieces are of corresponding beauty and value, and serve to show to what perfection modern science and skill have developed this very ancient branch of glass-making. The recent imitations by the same company, and by Salviati's, of Phœnician tear and toilet bottles so closely resemble the antique ones that antiquarians may well be in despair to distinguish the new from the old, especially if the corrosions, fractures, and little marks of age have also been attempted. I showed Mr. Alexander Nesbitt a beautiful bowl of delicate blue tint, with small heads or faces interspersed in the material, recently made by the Venezia-Murano Company, so precisely like the antique Roman that, after a careful examination, he said, if a fragment of it had been brought to him in Rome, he would have sworn it was ancient glass. We may now fairly consider that the lost art of both old Rome and old Venice has been reconquered by modern enterprise, for the subtle differences that still exist in certain technical points and invention, appreciable now only on closest study, may soon entirely disappear, and Venice once more supply the marts of the world with the finest artistic glass in old and new shapes. Among her work there are now to be seen excellent reproductions of the Christian glass of the fourth and fifth centuries, found in tombs and the catacombs. These consist of dishes, cups, and goblets, with designs in gold-leaf, chiefly heads of saints, emblems, and Bible stories, imbedded in the glass itself, or placed in form of medallions between two layers of different colors, which are fused together in the furnace into one compact mass.—*Italian Rambles.*

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## WHO DISCOVERED THE ELECTRIC TRANSMISSION OF SPEECH?

A book of absorbing public interest is announced shortly to appear in England and this country—a history of the telephone of Johann Phillipp Reis, with a biographical sketch of its inventor, by Professor Sylvanus P. Thompson.

The telephone outranks all previous discoveries in its direct enlargement of human power. The telescope and microscope are its nearest compeers. The telegraph, beside it, is a clumsy mechanism. The telephone, which makes a whispering-gallery of the round earth, may well exert an influence on civilization, comparable with that of the railroad and steamship. Already the business centers expand, and the values of city lands change, under the magic of an invention which places every man at every other man's ear. But this promise or prophecy of the telephone is not all that affects the interest of the American people. There is a menace in connection with its present history which justly awakens public concern. Rapacious hands have clutched the throat of the telephone, to extort oppressive tribute for every word which it utters.

Professor Thompson's book, which treats exhaustively the early history of the telephone, is therefore not only of scientific but of social interest and importance. It establishes beyond honest doubt or question, by historical evidence, by the reproduction of original documents and illustrations, and by the public ecords of scientific bodies, that Philip Reis discovered *the electric transmission of*

*speech* in 1860–61; that he elaborately described and exhibited his telephone in 1861; that he invented transmitting and receiving instruments, which not only talked then and talk now, but which include the essential principles of the transmitters and receivers now in use; and that he manufactured, placed on the market, and sold his instruments in 1863, for the purpose of illustrating the electric transmission of speech and song. That an invention so important, made in the heart of Germany, should not have been instantly perfected and utilized would surprise us in this country, if history did not abundantly teach that inventions, complete in themselves, often lie sterile until the favorable season and soil are found for their commercial adoption and development.

Professor Thompson, without the least imputation of plagiarism, shows, in parallel columns, the identity of expression between Reis and Bell, in their statement of the essential principles of the telephone. The impression of the identity of Reis's and Bell's discovery grows, page by page, during the perusal of this book.

The conclusion reached by Professor Thompson, from the survey of the whole field—a conclusion which seems to be fully borne out by the facts adduced—is the following: "There is not, in the telephone exchanges of England to day, any single telephone to be found in which the fundamental principles of Reis's telephone are not the essential and indispensable features."

This conclusion makes the speaking telephone, in its elementary form, free to the whole world. It opens wide the door for the future development of the telephone; and it should assure to all those who, by their genius and industry, in our day and generation, have improved or may improve the telephone, an ample pecuniary reward. The recompense due to the family of Philipp Reis should take the form hereafter, not of a tax, but a free gift from the world's gratitude.

This book comes, then, as a charter of freedom of speech in a larger sphere than ever before known.

In the light of historic facts which this book establishes, the decision of the courts of the United States that Professor Bell is the discoverer of a new and useful art (the electric transmission of speech), to which he has exclusive title, must be reversed as speedily as possible, that our courts may retain the respect of the people of the United States.—*Dr. W. F. Channing, in Popular Science Monthly for August.*

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A fine meteor, apparently about six inches in diameter, was observed at this city on the evening of the 23d of July in the southeastern sky. It fell almost vertically.

# ASTRONOMY.

## SUN AND PLANETS FOR AUGUST, 1883.

W. DAWSON, SPICELAND, IND.

The Sun's apparent annual motion around the Earth brings him on August 1st to Right Ascension 8h. 46m., and on the 31st 10h. 38m. His north declination on the 1st is 18° 00′; on the 31st 8° 36′; the change being nearly two hours of R. A., 9° 24′ of Declination. Solar spots have been quite numerous during July; and bid fair to make a fine show in August. During the first week in July a group of two or three large spots was very plainly visible to the naked eye—protected by a shade-glass. It attracted much attention, and was seen by many persons.

The constellation of Scorpio is still conspicuous in the southern sky, bearing westward as the month advances. Its principal star, the bright red Antares, souths on August 1st, at 7:35 P. M., and about four minutes earlier each succeeding day through the month. Alpha Lyræ, the bright star near zenith, crosses the meridian at 9:46 on the 1st, and the usual four minutes earlier on following days. Mercury is evening star this month; and about the 24th it is in near company with Uranus. Moving eastward Mercury becomes barely visible to the naked eye by the last of the month, a little south of west. Venus, Mars, Jupiter, Saturn, and Neptune, are all morning stars. The moon will pass among them the last week in August, making scenery of much interest to those who are fond of observing the heavens in the early mornings of summer. Soon after 5 A. M. of the 24th, she passes over Neptune, which would have been an interesting occultation had it occured two hours earlier. The next day soon after noon she passes Saturn, and a little before noon of the 27th, near Mars, visits Jupiter on the 28th about midnight, and Venus near the last hour of the month—being then near the Sun, or New Moon, which occurs seven hours afterward.

Saturn is near the bright star Aldebaran in the Hyades group, Taurus. In the morning of the 13th, the planet will be 3° 40′ north of the star. Mars moves rapidly eastward, and is below Saturn an hour or so; being the only bright star in the neighborhood it will be easy to recognize. During the first week in August Jupiter may be seen low in the NE., or rather E. NE. near the boundary of Gemini and Cancer; in the early morning. It will rise higher every day—being near two hours high at morning dawn the last of the month. His four moons can then be seen with a spy-glass one and one-half inches aperture.

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## THE SOLAR ECLIPSE OF MAY 6TH, 1883.

We cull the following items from the reports of Professors Holden, Hastings, and others, regarding the journey to Caroline Island and the phenomena of the eclipse as observed by them on May 6th. Professor Holden's report is made to Professor C. A. Young, Chairman of the Eclipse Committee of the National Academy of Sciences, and contains some details concerning the voyage and the stay of the observers on the island which, while out of the usual run of official reports, will be none the less interesting to the readers of the REVIEW. Prof. E. S. Holden belongs to the U. S. Naval Observatory, but is temporarily in charge of the Washburn Observatory, at Madison, Wisconsin, and was the principal officer of the American Expedition:

Journey from New York to Colon (1,989 miles), from Colon to Callao (1,722 miles), and from Callao to Caroline Island (4,324 miles). The six members of the American party sailed from New York March 1, 1883, on a Pacific mail steamship Acapulco (Capt. W. Shackford), and arrived at Colon March 11, after touching at Castle Island, March 7, to send off a mail. At Colon the expedition was joined by the English photographic party. As the steamer on the west coast of South America did not leave until the evening of March 12, the American party remained in Colon till the morning of that day, and went thence to Panama.

Every day during May a rehearsal for the eclipse observations was gone through with, and two days before May 6 everything was in complete readiness. On the morning of May 6 there were three showers and several persistent banks of clouds. The sky was clear at first contact (about 10h. 3m. local m. t.), cloudy at intervals till near totality, clear during totality, except slight haze during the first minute of totality, cloudy a few minutes after third contact, and finally clear at fourth contact. The observations of the various parties may be considered to have been successful. But the success was owing to the apparent accident of the dissipation of a local cloud. I am more than ever convinced that my conclusion to go to Flint Island, had I found the French party occupying Caroline Island, was a sound one.

On the twenty-third day out from Callao, we sighted one of the islands of the Marquesas group, and at 8 A. M., of April 20, Caroline Island was seen as a low green streak on the horizon. We had come 4,324 miles in twenty-nine days, mostly under sail (an average of 149 miles per day) without seeing a single sail or any land, except Magdelena Island, of the Marquesas, which we had gone out of our course to sight. I cannot refrain from quoting here Darwin's entry in his "Journal of a voyage in the Beagle," under date of December 19, 1835: "We now consider that we have nearly crossed the Pacific. It is necessary to sail over this great ocean to comprehend its immensity. Moving quickly onward for weeks together we meet with nothing but the same blue, profoundly deep ocean. Even within the archipelagoes the islands are mere specks, and far distant one

from the other. Accustomed to look at maps drawn on a small scale, where dots, shading, and names are crowded together, we do not rightly judge how infinitely small the proportion of dry land is to the water of this vast expanse."

It must be remembered that we knew absolutely nothing of Caroline Island, except that it had been inhabited in 1874 by at least one white man and some thirty natives. The boat landing was known to be somewhere on the south-western side, and an "entrance to the lagoon" was spoken of on the eastern side. The Hartford approached the island from this side, and from end to end there was nothing to be seen but a line of heavy breakers, then a strip of white beach, and above this a growth of trees, the highest of which were cocoa palms. Finally in among these was seen the gable roof of a European house, but no inhabitants. Coasting round the island, everywhere surrounded by high surf, the Hartford came opposite the place where the boat-landing was reported, and the whaleboat was lowered, and Lieut. Qualtrough sent in her to land, if possible. It seems all very simple now, after Caroline Island, its reefs, its lagoon, and its landing are as familiar to us as the beaches of New England; but at the time it was all quite strange and new. The advent of a man and dog on the reef was an event. It seemed to settle one thing at least, and that was that we should find some assistance in landing. But the native disappeared and Lieut. Qualtrough was left to find his own way among the breakers, which he did in a capital manner. The ocean reef forms a solid wall all round the island, except at one narrow and crooked entrance, just wide enough for a boat and oars, and through this entrance each boat must come, or be broken into bits against the steep face of the coral wall. The whaleboat returned shortly with the news that there were four native men, one woman and two children on the island, that two frame houses were standing, and that we could land at once.

At high water this ocean reef was covered to a depth of about thirty inches, and at low water to about ten inches. The boxes were then lifted from the boat and transported by carrying parties to the high-water mark, a distance of 1,400 feet. This transport had to be made over the ragged surface of the ocean reef and through water of a depth varying from one to three feet, as I have said. From high water-mark, other carrying parties transported the boxes along the beach of the lagoon and across the island to the site of our observatories (some 1,300 feet further) which had been selected by Dr. Hastings and myself. On board the Hartford I had prepared a plan of the proposed camp; the position of each observatory was fixed on the ground by a stake, and to this stake all the boxes of each instrument were brought. In this way all proceeded in an orderly manner. By the evening of the twenty-first all the boxes and baggage of the expedition were landed, as well as bricks, cement, lumber, etc., for the observatories.

The entire party slept on shore also; and I shall never forget the quiet rest of that cool night after the intensely hot day of active work. Our hammocks were swung on the wide veranda of one of the houses, close to the beach of the mirror-like lagoon. The wind was cool and fresh as it blew through a break between

two of the islands and directly from the open sea, the monotonnus roar of whose surf was incessantly heard. The nearly full moon was overheard and the long fronds of the cocoa palms made grotesque shadows on the level ground. Occasionally there would be heard the shrill cry of some sea-bird flying over, and other than this and the roar of the breakers, there was nothing to disturb the quiet and rest which came as a fitting conclusion to our restless month at sea.

During the 22d or April the Hartford remained by the island, and a force of carpenters and bricklayers proceeded rapidly with the construction of our observatories. By night-time the observatories belonging to myself, Dr. Hastings, and Mr. Preston were up, and piers of brick or wood completed. The brick piers of the English party were well under way, and were completed on the 23d by Mr. Wood, who thus added a new profession to his former acquirements.

The Hartford sailed at 6 P. M. of the 22d for Tahiti, and some of us went to the ocean reef to see her off. Besides her lights we saw those of L'Eclaireur, the man-of-war which was bringing the French eclipse expedition. Early on the morning of the 23d I met the maitre d'equipage of the L'Eclaireur on the reef and gave him such information as to the landing, etc., as I was sure would be of use. Shortly after this the French party came on shore for the day, and the morning was spent in aiding them to select a site for their observations, etc. This party consisted of M. Jansen, director of the Observatory of Astronomical Physics of Meudon; M. Trouvelot, assistant at the Meudon Observatory; M. Pasteur, photographer of the Meudon Observatory. These gentlemen were accompanied by M. Tachini, director of the Observatory of the Roman College; M. Palisa, astronomer of the Imperial Observatory of Vienna. Besides these astronomers there were seventeen of the crew of L'Eclaireur left on shore, making the French party twenty-two in number. Thus the total population of the island was fifty-one in all, including natives. Our relations with the gentlemen of the French expedition were throughout of the most cordial character. So far as our researches lay in the same direction, we worked together to a common end. It was a pleasure to us to be able to extend to them what aid was possible, and to receive the same in return.

During the remaining days of April everything was making progress toward complete readiness for observations of the eclipse. The observatory of Dr. Hastings and my own were completed by April 27, and each of us used a six-inch equatorial for some hours each night in an examination of the southern sky. During the course of this we detected some new doubles and red stars, a list of which is given later.

The vision was not especially good, and comparatively few hours were given to telescopic work, owing to the impossibility of obtaining a quiet sleep during the day. Still new double stars were found. This shows that if a suitable telescope were to be used in a favorable place in the southern hemisphere, at Quito or Santiago for example, a great number of new objects could be catalogued in a comparatively short time. It appears to me that this expedition is worth making. Immediately after the eclipse we commenced preparations for departure. These

occupied May 7 and 8, and at 5 P. M. of May 9, the Hartford, with the expedition on board, took her departure for the Sandwich Islands. We left Caroline Island with mingled feelings of pleasure and regret. Each one of us had at least some one thing left to do or to see, and yet it was a pleasure to leave the place where our mission had been accomplished, and to meet our friends in the ship, who were endeared to us by that intimacy which sea life induces.

It may be added, as Professor Holden's modesty excluded it from his report, that there was a spirited race between the French and American expeditions, of four thousand miles from the coast of South America. Each desired to reach Caroline Island ahead of the other in order to secure first choice of locations.

Professor C. S. Hastings, of the Johns Hopkin's University, also includes many interesting details in his account of the trip:

The voyage from New York to Panama was pleasant with the exception of a few hot days near Aspinwall. Somewhat further south the wind changed, obliging them to call their overcoats from the bottom of their trunks to keep out the cold when crossing the Equator. During a short stop in Lima the party had an opportunity of studying South American life. The products of this country are fruits and photographs of the young women. The party enjoyed both eating the former and bringing the latter home for the admiration of their friends. The expedition really began at Callao, where the party embarked on the United States man-of-war, Hartford. Few circumstances contributed more to the enjoyment of the trip than the luckychance which threw this vessel in their way. The Hartford was fitted out last August as flag-ship of the South Pacific squadron. The admiral had not yet removed his flag to the vessel, but the extra accommodations provided for him and his train condoned the dignity lost by his absence. On March 22 they weighed anchor for a sail of more than four thousand miles over the blue ocean which stretches between Callao and their destination, Caroline Island. The southeast trade winds favored them, and from the first day there was actually no necessity for altering the position of a sail.

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The inhabitants—five men, one woman and two children, according to to the eclipse census—are natives of Tahiti. The houses are one story structures with clapboard sides, probably cut out in California and brought out in ships, to be erected on this island. The island on which they are built is about three-fourths of a mile in diameter and nearly circular in outline. The edge, which rises from five to twenty inches from the water, according to the tide's phase, goes down under the water to an even table of coral running out many feet into the sea; and is impossible to step on it with bare feet. At the end of this table the reef goes down perpendicularly, a sheer precipice, into the unfathomable sea. No vessel can anchor here, and to make a landing was an exciting matter. The island was approached in small boats on the side sheltered from the wind, and here, with the luck which characterized the trip, was found the only opening in this barrier of coral. A long cleft, perhaps eight feet wide, at the outer edge of

the reef, ran in narrowing to a mere crack near the shore. Watching a favorable chance, the boats were guided through the surf into a cleft as far as shoal-water, when the men jumped on to the reef and carried baggage and instruments ashore as quickly as possible. The boats, which were new when they entered the surf, came out much the worse for wear, and the boat in which Dr. Hastings landed was stove in. Once on shore, life became a succession of wonders, rivaling the tales of Gulliver, and needing the conscientious descriptions of exact scientists to make them credible.

The members of the observing party took up their abode in the larger of the three houses, sleeping in swinging cots slung from the verandas, which afforded shade on three sides of the building. The second house was occupied by the sailors, while the third was left to the natives. These latter were sufficiently conversant with English to serve as excellent guides. Each day the party bathed in a lagoon in the centre of the island. This lagoon was bordered by a beach of dazzling white coral sand, and all through its water extended reefs of living coral of the more delicate and elaborate kinds. These corals gave the lake a wonderful variety of colors, forming a picture impossible to paint or describe, and with the least ripple from a passing breeze the whole scene changed to new groups of color. The water was very clear, and in some places deep; in others so filled with coral that a boat could barely skim over the surface without scraping the keel. After crossing a long reef, one day, they entered on a sheet of water so deep that their longest line would not reach the bottom, plainly visible beneath. Fish swarmed here, and it was characteristic of them that every species, if not brilliantly colored, was marked in the most peculiar manner. One variety which frequented the shallow water, where it was heated to the degree uncomfortable to the touch, was a pure milky white, with black eyes, fins and tail.

The French party arrived two days after the Americans. They had steamed directly from Panama with the hope of anticipating the Americans.

It rained on the morning of the eclipse, but cleared off in good time and the definition was particularly good. Photographs occupied the time of the English and French observers. Professor Holden and Dr. Dickson searched for intermercurial planets; Mr. Preston took the times of contact; Dr. Hastings and Mr. Rockwell devoted their attention to spectroscopic observations of the corona. Dr. Hastings' observations have led to the production of a new theory of the corona. Briefly stated, the theory is that the light seen around the Sun during a total eclipse is not due to a material substance enveloping the Sun, but is a phenomenon of diffraction.

From his observations during the eclipse of 1878, made at Central City, Dr. Hastings conceived the first idea of this explanation of the solar corona. Further study served to convince him of the truth of this theory, but he had no means of proving it. Before the present eclipse, however, he devised a crucial test of his theory. This test is based on the following already known phenomena. When the moon covers the face of the Sun an envelope of light is seen all round it, the envelope is not visible when the Sun is shining on account of the Sun's greater

brightness; this light is called the corona; it is extremely irregular in outline. According to the drawing of Mr. J. E. Keeler at the eclipse of 1878, it enveloped the Sun as a hazy glow extending for a distance of several minutes of arc from the Sun's limb, and at two nearly opposite points is extended out in two long streamers feathering off into space. The opinion has been that this light was due to an atmosphere extending for millions of miles from the Sun. According to Dr. Hasting's view it must be light from the Sun which has undergone refraction: *i. e.*, has been bent from its regular course by the interposition of an opaque body like the Moon.

In order to make this perfectly plain, suppose the front of a surface of waves of any sort to be striking an object which resists them. If an organ of sense is placed in the resisting object, it will judge the direction of the waves or the direction of the object producing them by a line at right angles to the wave front. Now suppose a body is placed between the object producing the waves and the sensitive organ. The waves must go around this body and will produce an eddy behind it, so that the wave front will have a different direction, and the organ of sense will conceive the origin of the waves to lie in a direction different from that before the body was interposed. Now consider the waves to be waves of light, and their origin the Sun. The organ of sense is the retina of the eye. The Moon is the opaque body interposed in the course of the waves, and they, being bent, make the impression on the eye that the light comes from beyond the edge of the Sun. The Moon covers the Sun during the eclipse and a little more, so that it can move for about five minutes and still cover the Sun entirely. This movement is very slight, and if the corona consists of light from a solar atmosphere, it should not change at all during this movement of the Moon. But if diffraction is the cause of the light, then the slightest change in the relative positions of the Sun and the Moon should change the configuration of the corona; *i. e.*, the corona should not remain exactly the same during a total eclipse. The character of the light as shown by a spectrum analysis should change.

To determine this point Dr. Hasting's invented the following instrument: Two lozenge-shaped prisms of glass were fastened in the form of a letter "V" and so arranged that all the light falling within the aperture of the "V" was lost, and that falling on the ends of the glass prisms was transmitted by a series of reflections to the apex of the "V," where the prisms touched; here was placed a refracting prism, so that the light could be analyzed. This instrument was attached to the eye-piece of the telescope and the image of the eclipse reduced to such a size that the Moon just fitted into the aperture of the "V," while opposite sides of the corona were reflected through the prisms to the place where they came together. In this way both sides of the corona were seen through the eye-piece at the same time. On looking at the eclipse this is what Dr. Hastings saw: The light of the corona was divided into its constituents. Prominent among them was a bright green line, which is designated by the number 1,474; to this line attention was directed. Its presence in the spectrum has been an argument in favor of the view that the corona is a solar atmosphere. If this is the case,

the line should remain fixed during the eclipse; but if the corona is due to diffraction this line should change; it should grow shorter in the light from one side of the corona, and longer on the other. The observation was now reduced to watching for a change in the relative length of two green lines.

At the beginning of totality the line from the west side was much the longer, but as the eclipse progressed it shortened notably, while the line from the east side, shorter by about one-third at the beginning of the eclipse, grew longer. When the eclipse ended the proportions of the lines were exactly reversed. There had been a change equal to two-thirds the length of the lines, while the Sun and Moon had only changed their relative positions by an extremely small amount. The only way in which this phenomenon can be accounted for is on the defraction theory. The material view of the corona will not answer for it. But there are other discrepancies in the older view which have been known for some time. The principle ones are: 1. It is known from study of the Sun that the gaseous pressure at the surface must be less than an inch of mercury, and is probably less than one-tenth of an inch, but an atmosphere extending to the supposed limits would cause an enormous pressure at the Sun's surface, especially since the force of gravity on the Sun is very much greater than on the earth. 2. The laws of gravitation would require a solar atmosphere to be distributed symmetrically around the Sun, while the corona is enormously irregular in form. The Sun is irregular in outline, which would make its diffracted phenomena show the observed irregularity, but it is symmetrical as regards density. 3. The most interesting discrepancy of the theory of the solar atmosphere is the fact that while it is supposed to extend for millions of miles from the Sun, the recent comet passed within two hundred thousand miles of the Sun, and yet its orbit was not affected in the least—as it would have been if it had ploughed its way through a material substance. In taking photographs of the corona it is seen to be larger as the time of exposure is longer. This shows that the corona extends indefinitely, and it decreases in brilliancy in exact accordance with the mathematical laws of diffraction. These laws involve very complicated mathematics, but by them alone Dr. Hastings has proved that there must be diffraction where the corona is, and that it must follow the same laws as those observed. There is a small envelope around the Sun, but in the opinion of Dr. Hastings it does not extend beyond what is known as the chromosphere.

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The question seems to be settled, with considerable certainty, that nothing exists inside of Mercury large enough to be dignified by the name of planet. There may be, and there probably are, for the perturbations of Mercury indicate it, multitudes of small masses circulating around the Sun like the planets, being fragments of comets or condensations of primitive matter, whose combined lustre is seen in the Zodiacal Light.

The other results of the work of the Commission, so far as now known, are connected with the structure of the corona, the solar appendage, which extends

out for millions of miles from the Sun's disk. In the photographs of the Egyptian eclipse of last summer these streamers can be traced back of each other where they cross; no better proof of their extreme tenuity could be given.

The duration of an eclipse of the Sun depends on three things, the distance of the Sun from the earth, the distance of the Moon from the earth, and the distance of the station from the equator. All or these were favorable to a long eclipse in the case of the recent one, and the six minutes of totality gave opportunities for deliberate work not often enjoyed. For the complete result we must await the official report.

# METEOROLOGY.

## REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The usual summary by decades is given below.

| TEMPERATURE OF THE AIR. | June 20th to 30th. | July 1st to 10th. | July 10th to 20th. | Mean. |
|---|---|---|---|---|
| MIN. AND MAX. AVERAGES. | | | | |
| Min | . . | . . | . . | . . |
| Max | . . | . . | . . | . . |
| Min. and Max | . . | . . | . . | . . |
| Range | . . | . . | . . | . . |
| TRI-DAILY OBSERVATIONS. | | | | |
| 7 a. m. | 67.6 | 73.8 | 74.2 | 71.9 |
| 2 p. m. | 85.9 | 72.4 | 88.4 | 83.9 |
| 9 p. m. | 73.0 | 72.4 | 73.4 | 72.9 |
| Mean | 75.5 | 74.3 | 77.3 | 76.2 |
| RELATIVE HUMIDITY. | | | | |
| 7 a. m. | .92 | .91 | .90 | .91 |
| 2 p. m. | .76 | .77 | .72 | .75 |
| 9 p. m. | .90 | .90 | .87 | .89 |
| Mean | .83 | .86 | .83 | .85 |
| PRESSURE AS OBSERVED. | | | | |
| 7 a. m. | 29.15 | 29.47 | 28.96 | 29.19 |
| 2 p. m. | 29.02 | 29.06 | 28.92 | 29.00 |
| 9 p. m. | 29.06 | 29.06 | 28.91 | 29.01 |
| Mean | 29.07 | 29.19 | 28.93 | 29.03 |
| MILES PER HOUR OF WIND. | | | | |
| 7 a. m. | 8.6 | 11.5 | 6.5 | 8.9 |
| 2 p. m. | 12.1 | 17.1 | 4.1 | 11.1 |
| 9 p. m. | 7. | 10.7 | 3.8 | 7.2 |
| Total miles. | 2103 | 2829 | 2863 | 7795 |
| CLOUDING BY TENTHS. | | | | |
| 7 a. m. | 2.8 | 3.0 | 6.5 | 3.8 |
| 2 p. m. | 5.2 | 5.1 | 4.1 | 4.8 |
| 9 p. m. | 1.8 | 3.0 | 3.8 | 2.8 |
| RAIN. | | | | |
| Inches. | 2.15 | 3.07 | .58 | 5.80 |

The period embraced in this report has been rather above average temperature for this season and we can again record quite a heavy rainfall.

On fifteen days the temperature has reached 90° and upward, the highest being 98° on June 30th. The lowest temperature was 62° on June 23d. Highest barometer, July 18th, 29.300, reduced to sea-level and zero, 30.235. Lowest barometer, July 12th, 28.780, reduced 29.708.

On June 23d, just after a heavy rain-storm, the air having had a temperature of 65° to 70° all the forenoon, the temperature suddenly rose more than 20° in consequence of a hot current of air from the south. This lasted but half an hour when the temperature fell as suddenly as it had risen.

On the evenings of the 7th and 8th of July auroras were visible at this station about 9 o'clock in the evening. The wind travel has been less than any previous month this year, and no very high gales have occurred here. The prevailing wind has been from the south as usual at this season.

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## BOOK NOTICES.

FROM THE PYRENEES TO THE PILLARS OF HERCULES: By Henry Day; 12mo., pp. 249. G. P. Putnams' Sons, 1883. For sale by M. H. Dickinson.

As is justly remarked by the author of this work, Spain lies out of the ordinary route of travel and less is known of it than of any European State. It has a wonderful history which has never been well written by English authors, though the most valuable illustrations of it have been produced by such American writers as Prescott, Irving, and Ticknor, within the last half century. The mixture of Roman, Moorish, and Teutonic blood in the veins of its people gives them a peculiar character, accounting, perhaps, for their romantic and passionate temperaments, their daring and domineering dispositions, but not for their lack of that pertinacity and steadfastness of purpose which insures success. With greater opportunities than almost any other people, none has made a more disastrous failure as a great factor in the world's history. Although in the sixteenth century it was one of the most wealthy and powerful of the nations of the earth, and its literature, art, and fashions held sway in all the courts of Europe, its want of national coherence was such that it never crystallized into a first-class power, but gradually declined, until now it is principally engaged in internecine wars and occupies one of the lowest positions among European nations. The climate is admirable and the valleys lovely, and as our writer observes "it is no wonder that the Moors from the hot deserts of Africa and the level, sterile wastes of Arabia, glowed with delight as their eyes rested on these charming valleys. No wonder they fought to obtain them and periled their all to keep them. Here they found the orange, the fig, the aloe, the pomegranate, the grape, and the

palm, the almond and the sugar-cane, the mulberry and the cotton-tree, the citron and the olive, all growing side by side. Here was perpetual spring."

Recently tourists are turning their attention in this direction more than formerly, several citizens of this region, even, having visited its classic shores and medieval cities within the past few years.

The author of this work writes very pleasantly and instructively of Barcelona, which is so old that the local historians claim that Hercules founded it 400 years before Romulus was born; of Montserrat, one of the many and perhaps the most celebrated of the sacred shrines of Spain; of Saragossa, the capital of Arragon, named after Cæsar Augustus; of Madrid, with its treacherous climate, its attractive armory, museum and picture galleries, of the Escorial, a sublime and costly monument of folly erected to the memory of Charles V; of Toledo, once the capital of the Goths, then of the Moors and finally of the Christians, each of whom in turn devoted it to the priests and kings; of La Mancha, better known as the "stamping-ground" of Don Quixote and his doughty squire, Sancho Panza, than for anything else. Cadiz, Gibraltar, Tangier, Morocco, Malaga, and Burgos, each receive a description, and the book closes with the Pyrenees, with their lofty snow covered peaks, remaining both as to cultivation and the habits and customs of the people, in the same primitive state as centuries ago.

The reader will be well repaid for the time consumed in reading this book.

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MANUAL OF ASSAYING GOLD, SILVER, COPPER, AND LEAD ORES: By Walter Lee Brown, B. Sc., with illustrations; 12mo., pp. 318. Jansen, McClurg & Co., Chicago, 1883. $1.75.

This work, though prepared especially as a guide to students and persons having no previous technical knowledge of assaying, will be found very useful to all who have occasion to refer to a thoroughly practical hand-book. It is clearly and plainly written, with all necessary details, descriptions of apparatus, reagents and processes for the unpracticed operator, while the appendix contains instructions for special methods, lists of gold, silver, copper, and lead-bearing minerals, lists of books applicable to the subject, etc.

As an evidence of the practical method and form of its arrangement we select from the table of contents a few titles of chapters and sections, premising that there are sixty-nine illustrations of the various implements and tools used in assaying. Eighty-one pages are devoted to describing apparatus, such as scales and balances, furnaces and furnace tools, glass and porcelain implements, and miscellaneous apparatus; twenty-seven pages to reagents, such as wet and dry reagents for assaying and reagents for analysis: eight pages to preliminary work, testing reagents, etc.: forty-two pages to the assaying of gold and silver ores, with their occurrence, preparation of the sample, assay by the scorification process and by the crucible process: four pages to the assay of copper ores by the method for native copper, the method for oxides and carbonates of copper free from sulphur, and the method for the sulphides of copper with antimony, arsenic, etc.,

and ten pages to the assays of lead ores by the methods for galena and by the methods for oxides and carbonates.

All of this is most carefully worked out and thoroughly detailed, so that apparently an ordinary assay may be made by an inexperienced hand after a very brief practice.

The appendix contains explanations of and directions for assaying of the various minerals contained in an ore; of ores containing free gold or free silver; analysis of copper ores, amalgamation assay or laboratory mill-run; pan-test for gold "panning"; chlorination assay for gold ores; chlorination test for silver; assay of gold bullion and base bullion; color tests, scorification, scorifier, cupel; qualitative tests, carbonates, chlorides, sulphates, sulphides, tellurides, copper, iron, lead, silver; a brief scheme for silica, iron and manganese, and determination of moisture in an ore.

To this is added a chapter giving lists of the principal gold minerals in the United States, and minerals likely to carry gold; list of the principal silver minerals found in the United States, and minerals likely to carry silver; list of principal copper and lead-bearing minerals of the United States; list of useful books upon assaying, chemical technology, laboratory manipulation, mining law, etc.

Section third comprises tables of values of gold and silver, tables of weights; equivalents of some English and French weights; assay ton equivalents in grammes, Troy grains and Troy ounces. The work closes with a copious and well arranged index.

We have been more particular than usual to give in detail the contents of this manual because we have been asked several times by friends and acquaintances engaged in prospecting and mining to recommend a simple and practical work suited to the circumstances and surroundings of such persons. This we can candidly do in regard to this book and at the same time assure them of a neat, tasteful, well printed volume at a low price.

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ITALIAN RAMBLES: By James Jackson Jarves; 16mo., pp. 446. G. P. Putnam's Sons, New York, 1883. For sale by M. H. Dickinson; $1.25.

In this study of the life and manners in the new and old Italy, the reader perceives the difference between the work of the hasty tourist who rushes across the country by rail and writes his observations from the guide-book, and that of the experienced traveler who has given months and perhaps years to a district, until he knows its byways as intimately as its highways.

Mr. Jarves has spent many years in Italy, and these "Rambles" are the resultant. No one can read them without observing an unaccustomed tone of familiarity with the various topics treated, frequently wanting in the sketches of better known writers and travellers. Besides this, the style of the author is familiar, breezy and artistic, showing the scholar and the man of taste. The topics are mostly outside of the range of the ordinary observer, which renders them still more attractive. Pescaglia, Serra in the Appenines, In Porsenna's

Country, Ancient days in Venice, Ancient and Modern Glass of Murano (part of which we copy in this number of the REVIEW), The Gates of Paradise, Klagenfurth, A Lesson for Merchant Princes, and New and Old World Manners, are fair samples of the titles of the articles presented.

The work is handsomely gotten up by the publishers, as usual, and will have a large sale if it meets its deserts.

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STUDIES IN BIOGRAPHY: Edited by Titus Munson Coan. 16mo., pp. 246. G. P. Putnams' Sons, N. Y., 1883. For sale by M. H. Dickinson. Cloth, 60c; Paper, 25c.

This is the second volume of the "Topics of the Time" series, to which we called attention last month, and comprises sketches of the lives of Leon Gambetta, Jonathan Swift, Miss Burney, and Samuel Wilberforce; also a Lucianic dialogue between Lord Westbury and Bishop Wilberforce; an account of the life and work of George Sand (Madam Dudevant), and a final chapter upon Literary Bohemians, in which the Bohemian instincts and practices of Dumas, Victor Hugo and other well known writers are depicted and discussed.

This series is skillfully presented by the editor and cannot fail of being popular. The next number is entitled "Studies and Literature" and comprises American literature in England; Hamlet, a New Reading; The Humorous in Literature; The Bolandists; The Unknown Public, and The Isaiah of Jerusalem.

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MAN BEFORE METALS: By N. Joly. 12mo., pp. 365; Illustrated. D. Appleton & Co., New York, 1883. For sale by M. H. Dickinson. $1.75.

This is number XLV of the International Scientific Series and corresponds very well in character with the other volumes of that valuable series. It is divided into two parts, the first of which is devoted to The Antiquity of the Human Race, and the second to Primitive Civilization. In both of these the general facts of archæology are presented about as they are by Lyell, Quatrefages, Tylor, Figuier, and others, and the conclusions drawn do not differ materially from those of other French writers upon the subject. The general course of M. Joly's discussion is The Prehistoric Ages; The Work of Boucher de Perthes; The Bone Caves; The Peat Mosses and Kitchen Middens; The Lake Dwellings and the Meraghi; Burial Places; Prehistoric Man in America; Man of the Tertiary Epoch; The Great Antiquity of Man. In part II he takes up Domestic Life, Industry, Agriculture, Navigation and Commerce, The Fine Arts, Language and Writing, Religion, The Portrait of the Quaternary Man.

The chapter upon Language and Writing, including the Origin of Speech, is one of the most original and interesting of the whole, while that upon Religion is a learned compilation of authorities such as can be scarcely be found in any other work, which will be appreciated by all students, and from which all readers will not necessarily reach the same conclusions as the author.

# SCIENTIFIC MISCELLANY.

## SOME FACTS ABOUT CHOLERA.

Medical men are not very well agreed about the origin of cholera epidemics, and are still less in harmony in their application of remedies. But by common consent few diseases are more severe, or more quickly and surely fatal, than cholera. Efforts have been made to establish a connection between its appearance and the recurrence every twelve years of great Hindoo pilgrimages and festivals, and the writer of a learned article in a popular cyclopedia, published some years ago, went so far as to predict visits from this plague in 1877 and 1879. These prophecies were not fulfilled. The truth of the matter seems to be that the exciting causes of cholera are always active in some parts of India, in the Philippine Islands, and in other far eastern countries, and that the methods of commerce prevailing nowadays are most favorable for disseminating the pestilence throughout the world. Its ravages have been extensive and almost constant for at least two years in the regions of its origin, and it has now broken out in Egypt, and possibly also at Gibraltar and London. There is much reason to believe that it will appear before many months in every country of Europe, and in this country also.

It is now generally held that cholera is not, strictly speaking, "contagious." that is to say, it is not spread by touch, pure and simple. Its seeds, in order to do their work, must be introduced into the system through the lungs or the the stomach. The most frequent means of their spread is the use of contaminated water. Some authorities, indeed, go so far as to say that all the most virulent epidemics have been connected with the pollution of drinking water by choleraic evacuations, and that there is but little danger of a very extensive outbreak of the disease in any city where the drinking water is originally pure, and is conveyed in close and clean pipes. It seems, however, that the infecting matter in the discharges from the bowels of those who have the disease is apt to be diffused through the air or become attached to clothing, and thus to find entrance into the lungs of healthy persons.

It is still undetermined whether the morbid material that constitutes the cholera poison is a parasitic germ or a miasm. And no one professes to know how the poison is generated, or why it tends to spread more widely at some times than at others, or how the presence of decomposing matter and certain conditions of climate and soil, and certain physical characteristics of individuals, favor its distribution. The disease, in short, is known only in its effects.

The thing to be done, therefore, is to take heed to the conditions under which fatal effects are most likely to be produced, and to see to it that the poison-

ous matter does not find lodgment in the system. The best authorities say that the prime factor in the spread of the disease is the transmission from one locality to another of the specific infecting matter. This is brought about, so far as it is positively known, only by the migration of infected persons. Cholera moves along great lines of travel. Hence its sudden leap from Cairo to London. No matter how violently cholera may rage, he who drinks no water, eats no food and breathes no air polluted by cholera patients is reasonably certain of escape. Every precaution of course ought to be taken against the disarrangement of any function of the body by eating unripe or decayed fruit, breathing sewer-gas, or neglecting obvious sanitary requirements. But in the case of healthy and prudent persons the chief danger lies in the use of impure water.

Inasmuch as the plague is known to be approaching the United States every family and every community obviously ought to prepare itself to meet it. It is of the utmost importance to cleanse outhouses and back yards, to dispose of every scrap of decaying vegetable and animal matter, to pour sunlight and air into damp, dark cellars, and above all, to see to it that there is absolutely no drainage from cesspools into cisterns and wells. Every householder must look out for these things for himself, bearing in mind that in making ready to ward off cholera he is also averting diphtheria, scarlet fever and other scourges. Towns and cities, moreover, have warning of the impending pestilence in time to improve their sewerage and water connections where they are defective, and to put their streets into proper shape. And, finally, preparations should be made at once by the proper authorities to enforce the most rigid inspection of vessels coming from parts where cholera exists, together with a perfect quarantine when the disease appears.—*Globe-Democrat.*

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## THE STUDY OF GREEK.

Inasmuch as the number of people who know Greek is very small, while the number of those who are ignorant of it is very great, it is not to be wondered at that the recent counterblast of the Adams family against the study of the Greek language has been widely approved. But it will hardly do to consider ignorance of any subject as a qualification for sound criticism on that subject, and the grand and wondrous tongue which for more than two thousand years has stood forth as the perfection of intellectual achievement, will probably survive the new objection to it that none of the Adams family had been able to master it. If the world is put to it and is compelled to choose between the wisdom of the Greeks and the wisdom of the Adamses, we are very certain that the Greek language and Greek literature will still be a living influence in ages when the Adamses will be forgotten.

Merely as an intellectual exercise the study of Greek stands highest and chiefest in the scheme of mental training. The range of mathematical training is limited and its influence is limiting; the study of the natural sciences widens

and strengthens the mind, but it leaves out culture. Metaphysics and logic and all philosophy of the mind or of the morals cannot be mastered by one who is ignorant of Greek. It is the key to poetry and to art, which are rightly understood only by those who rightly understand the Greek spirit and temper, and in the intellectual life there is no achievement and no perfection which is not so interwoven with Greek influences and teaching as to vindicate for the language of Greece a higher place than has ever been claimed for it in the customary schemes of classical study.

Let us not be misunderstood as undervaluing the practical demands of the age, with which Greek has little or nothing to do. We recognize that the primal duty of every citizen is to provide for the material wants of his nature. But if success in life means mere material success—dollars and cents—then, if experience goes for anything, the best education is no education at all. Not only is the study of Greek a loss of time, but all study is loss and waste. Our colleges are luxuries and our sons are wronged when we do not put them on their own resources at ten years of age to work their way to a fortune first and to education afterward.

But if education has any meaning and any value, if the systematic training of the mind is worth considering, if it is worth more in itself and in its consequences than the random picking up of information here and there as we go on, then the study of Greek is so far removed above the reach of disparagement that it needs no apologist. Its structure is the most perfect, its capacity the greatest, its resources the most ample, its beauty the most admirable of all languages, and as the human race in all its history has never produced another so perfect language there is no reason to expect that it will ever do it in the future.

Even in our daily lives the best and highest influences still come from the old Greek culture and development. Philosophy has never gone beyond the Socratic level; poetry still calls Homer master; in every branch of literature the best models are still Greek models; there has been no art since Greek art died, save the Gothic architecture and the Renaissance in painting. We cannot escape from the influence of the Greeks if we would.

The stars in the heavens still bear the names given them from Grecian mythology; the legends and history of Greece are part of the common stock of the world's phrases, and the unlettered citizen who reads in the daily paper of the cup of Tantalus or of the sword of Damocles does not write to the editor to know what he means. The multifold millionaire does not name his yacht the Wabash or the Wamsutta, but recalls the sweet story of the snowy-footed Arcadian, Atalanta. Even the politician who would trace back the current of human freedom to its source does not stop with Thomas Jefferson or with Brutus: he must go back to Solon and Lycurgus, to Harmodius and Aristogiton.

And we are asked to believe that the language which holds and guards this wealth has no value in itself! The proposition is inherently absurd. It involves a contradiction in terms: it denies what it asserts. As long as the instincts of humanity lead upwards and the need of a higher life of the mind is recognized, the language and literature of Greece will have the value of standard gold, and

the regret will be, not that time is lost in their study, but that the hard conditions of life unfortunately permit so few to become the masters of the treasure.—*N. Y. World.*

# EDITORIAL NOTES.

THE thirty-second meeting of the American Association for the Advancement of Science will be held at Minneapolis, Minnesota, from the 15th to the 21st of this month. The officers this year are Prof. C. A. Young, President; F. W. Putnam, Permanent Secretary; J. R. Eastman, General Secretary, and William Lilly, Treasurer. The chairmen of the nine sections of Mathematics and Astronomy, Physics, Chemistry, Mechanical Science, Geology and Geography, Biology, Histology and Microscopy, Anthropology, and Economic Science and Statistics are the Vice-Presidents of the Association.

The headquarters will be at the State University. The citizens of Minneapolis have made liberal arrangements for the accommodation and entertainment of all who attend, and the railroads have made low rates in all directions, in addition to giving excursions to Minnetonka and Winnepeg at less than half fare. Without doubt the meeting will be an enjoyable one in every respect.

THE Kansas City Academy of Science has recently received from Thos. J. Wilson, Esq., a box of beautiful specimens of the fossil wood from the petrified forests of Arizona; also a box of valuable fossils from Mrs. Todd, of Fort Worth, Texas.

The Curator of the Academy, Mr. Sidney J. Hare, is now on a surveying expedition in Southwestern Kansas and may be relied upon for liberal contributions to its Museum. Dr. R. Wood Brown is performing the duties of Recording Secretary and acting Curator.

THE rain and wind-storms of June, 1883, will long be remembered as being abnormally universal, frequent and severe. In this locality the precipitation was extraordinary, rain having fallen upon thirteen days up to the 27th. The Missouri River on the 27th had risen to twenty-four feet six inches above low water mark, or within two feet eight inches of the highest point reached in 1881. The mountain freshets are reported on their way down.

PROF. F. W. CLARKE, for many years chemist of the Cincinnati University, has received the appointment of chemist to the U. S. Geological Survey, and has removed to Washton City. He has contributed several articles to the REVIEW within the past few years and in a recent letter says: "I owe you my sincere thanks for the REVIEW and if I can at any time help you with items I will do so."

REV. H. C. MCCOOK, of Philadelphia, recently delivered a lecture upon "The Homes and Habits of Ants" before the Detroit Scientific Association and Griffith Microscopical Club, in which he gave some very graphic and interesting details, paying many high compliments to the ant for industry, intelligence, cleanliness, engineering skill, and various domestic virtues; among which the reporter selected the following: "Before marriage the female ant has wings, which are merely ornamental, and on becoming a matron she tears off these ornamental wings with her mandibles, and plunges into the ground, where she devotes her life to sober domestic duties, for which such gaudy attire would not have been suitable. All the work and all the fighting is done by the females and neuters. The males have no mandibles with which to work or fight, and so don't amount to much."

PROF. F. W. PUTNAM, Curator of the Peabody Museum, Cambridge, Mass., writes, July 5th: "I have compared the fragment of soapstone pot you sent me from New Mexico with the soapstone from which the Colorado and New England specimens are made, and it is not like either. I do not know the region from which the New Mexicans obtained their soapstone, and this is the only specimen I have seen from New Mexico, so far as I now remember."

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THE American eclipse expedition returning from the central Pacific reached San Francisco June 11th. Prof. Holden reports no discovery of Vulcan. Prof. Hastings' observations prove the Sun's corona to be probably a phenomena of diffraction, the real corona being only a narrow ring around the Sun widened out by diffraction (not refraction) in the extensive halo actually observed.

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MR. E. R. KNOWLES, the author of the articles in this number of the REVIEW entitled respectively "Père Hyacinthe and Catholicism" and "The Nature of the Existence of Matter," is a striking illustration of the peculiar adaptiveness of genius. An actor by profession and one who has already achieved quite a reputation in the east by his careful and artistic renditions of difficult characters, he has also found time to manifest his scholarship and his talent for polemical and metaphysical studies, as these articles sufficiently prove. Although quite young, he is a graduate of Princeton College, and already a successful business man and a promising artist and *literateur*.

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MR. FLETCHER, in the *Mechanical World*, says that the light given by an ordinary gas-burner can be increased at least one-sixth simply by using in place of the ordinary upright burners those that throw the flame out horizontally. He has tested them in his works and offices until he is satisfied that a burner consuming five cubic feet of gas per hour with a horizontal flame gives a better light, and is better for work, than an upright flame consuming six cubic feet per hour.

EXPERIMENTS recently made in Egypt show that the stars are about one-fifth of a magnitude brighter there than in England. This difference, which is due to the greater clearness of the atmosphere, brings into view an immense number of faint stars, which are just too faint to be visible in the more murky climate. To secure the same advantage it is now proposed to place observatories on mountain tops above the lower and denser strata of the atmosphere. Hence we have the Lick Observatory on Mt. Hamilton, in California, and an observatory just erected on the slope of Mt. Ætna.

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THE Arctic expedition ship Proteus was at St. Johns, N. F., actively preparing for Lady Franklin Bay on the 28th of June.

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BOUND volumes of the REVIEW for the past year can now be had at this office upon the return of the back numbers of Volume VI., and the payment of one dollar.

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CLUBS of four or more are allowed a discount of twenty-five per cent upon the regular subscription price of the REVIEW, and all subscribers to it can purchase other magazines and books at from fifteen to twenty-five per cent below the regular prices.

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THE Missouri State Board of Agriculture, in pursuance of the purpose for which it was organized, the promotion of the agricultural interests of the State, will hold several Farmers' Institute meetings during the present year. Able specialists will deliver practical addresses on topics of constant interest to the working farmer. The Board desires to hold several meetings, one or more after harvest, during the month of August, and several during the early part of winter. All expenses of these Institute meetings, excepting hall hire, will be met by the Board. Meetings will be held where the interest manifested promises a good attendance. The Secretary is desirous of an early response, at Columbia, from those communities wishing an Institute meeting, that speakers may be engaged in season for an ample notice of the meeting to be given.

THE University of Missouri is about to undergo a much-needed improvement in its main building. The legislature at its last session appropriated $100,000 for the purpose, and the work is about to be commenced. When completed, this building will present a handsome front of 356 feet, the present frontage being but 156, and the interior changes will correspond in elegance and degree.

MR. SIMEON STETSON, of San Francisco, has written a political pamphlet entitled "The People's Power, or How to Wield the Ballot," which is very highly commended in several of the papers of that city. It is a work of some 64 pages, and is evidently the result of deep thought and extensive research. As the price is but 20 cents, the thoughtful voters of the country can readily supply themselves with it.

MR. HERBERT ROBINSON, of Linn County, Kansas, occupies nearly two columns of the *La Cygne Journal* with a description of certain ores of gold and silver found on his father's farm, giving the corroborative opinions of exports and the results of many assays made in Colorado, Montana, Kansas City, and New York, and closing with the affirmation that "within five years the Big Sugar Creek region in Linn County will be turning out as much gold and silver as some of the best mining districts in the Rocky Mountains."

MR. G. W. LETTERMAN, of St. Louis County, Mo., has recently shipped three hundred bushels of acorns and one hundred and twenty bushels of hickory nuts to Europe for seed.

THE main building of the Indiana University was struck by lightning on the 12th *ult.* and utterly destroyed, with all its libraries, museums, cabinets, and collections of all kinds. The library contained about 14,000 volumes, besides thousands of pamphlets and periodicals. The museum contained the Owen cabinet of 85,000 specimens, an entire University series of Ward's casts, Professor Jordan's collection of fishes, numbering over 30,000, and all of the new and costly apparatus of the laboratory. The loss will probably amount to $125,000.

AMONG the many striking and useful features of railway management introduced on the Southwestern lines by Mr. A. A. Talmage, Manager of Transportation, is one which provides for the careful qualitative analysis of all waters intended for use in the boilers of locomotives used on that system of roads. No tank is built till it is first ascertained that the water to supply it is fit for boiler use.

A PETRIFIED forest was recently discovered in the Buckskin Mountains on the Arizona side of the Colorado river, near where the latter cuts through the range. Petrified trees were found twenty inches in diameter, and it is said that there is not a bush, piece of sage brush, or grass in the entire forest—some 300 acres—that is not turned to stone!!!

PROF. JAMES P. MCLEAN, of Hamilton, Ohio, and Prof. French, of Clyde, Ohio, have been examining the big mound at Cahokia, Ills., near St. Louis, and also paid a visit to the collections of the St. Louis Historical Society. They are making a tour of inspection of all the Mound-builders' works in the Mississippi Valley.

THE greater portion of the philosophical, chemical, and astronomical apparatus of the celebrated Dr. Joseph Priestly, the discoverer of oxygen, has been sent by the family of his great grandson, the late Dr. Joseph Priestly, to the Smithsonian Institution, and will be prominently displayed in the grand national museum.

THE rain-fall of June, 1883, was in excess of any year on record in this portion of the country. At Topeka it was 7.05 inches, at Lawrence 7.73, and Leavenworth, 10 84. The average rainfall in the same month for 16 years past at Lawrence has been 5.11 inches, and at Leavenworth, for the past 13 years, 5.48 inches.

AT the thirteenth annual meeting of the Troy Scientific Association, Mr. Thomas Pray, Jr., editor of *Cotton, Wool and Iron*, exhibited some photographs of cotton and wool fibres, executed by himself, which excited the admiration and enthusiasm of all who saw them, as representing these fibres more perfectly than is usual under the best microscope, unless in the most expert hands.

PROF. E. T. NELSON, of the Ohio Wesleyan University, reports 9,202 specimens added to its museum for the year ending June 15, 1883.

ALDERMAN HADLEY, of London, the famous electrician and capitalist, is in New York investigating the American system of telegraphing, and is largely interested in the new cables to be laid from New York to London soon, in connection with the Postal Tel. egraph Company's lines. He is also interested in a new line between New York and Chicago and New York and Cleveland, which is expected to compel the reduction of telegraphic rates, all through the East, at least.

WE have received a note from the Secretary of the Tuscan Society of Natural History at Pisa, Italy, which is so complimentary in its character that we reproduce it literally:

"PISA, 18 Jun, 1883.

"SIR:—The Societa Toscana di Scienza Naturali have only received of the KANSAS REVIEW Vol. III., No. 10; Vol. IV., No. 8; Vol. VI., No. 1, 4, 5. She your pray to sent the other party." ——— ———,

Secretary.

ROBERT HOWELL, of Nichols, N. Y., has twenty volumes of the U. S. Coast Survey Report, 1851 to 1870, for sale low, or for exchange for books on science, history or travel.

JOHN P. JONES, now of Kingman, Kansas, who has furnished several valuable historical articles in the past, says: "I enclose $5.00 for the REVIEW. I trust you will be able to keep its head above water until it becomes well enough appreciated to be a source of profit as well of pleasure to you."

WE are indebted to Dr. Edwin R. Heath for copies of the Bulletins of the Royal Geographical Society of England for the months of January, February, March, April and May, 1883.

## ITEMS FROM PERIODICALS.

*Subscribers to the* REVIEW *can be furnished through this office with all the best magazines of the Country and Europe, at a discount of from 15 to 20 per cent off the retail price.*

THE *Modern Argo*, of this city, is the best society weekly published in the west. It is edited by Mrs. Jennie M. Hicks, and its business manager is Mr. Isaac N. Hicks, both veterans in the newspaper business in the Missouri Valley. The *Argo* has deservedly a widely extended and a rapidly increasing circulation.

WITH its issue of July 5th, the *Art Interchange* entered upon its eleventh volume. During the five years of its publication this journal has grown from a four-paged sheet—without illustrations, supplement sheet, or "questions and answers" to one of sixteen pages, with a profusion of illustrations representative of both pictorial and decorative art, and an inquiry department, which, for fullness, accuracy, helpfulness, and diversity of subjects treated, is unrivalled. It is proposed in the present volume to continue the illustration of designs suitable for furniture and general decorations in answer to requests, and to continue also to issue "Notes and Queries Supplements."

The most important step in advance, however, is the publication at intervals of one month—after January, 1884, making twelve in the course of a year—of studies in color. These will include flower and figure subjects, and each design will be in several colors.

THE *Western Scientist*, a monthly magazine devoted to the natural sciences is announced to appear very soon. It is to be published by the Western Scientist Co., at Ottumwa, Iowa, at $2.00 per annum.

THE *North American Review*, for August, opens with a very spirited and timely discussion of the subject of "Moral Instruction in the Public Schools," by Rev. Dr. R. Heber Newton, who offers a practical scheme for conveying ethical instruction without reference to religion tenets, and the Rev. Dr. Francis L. Patton, who maintains that the Bible must be made the basis of all moral teaching. Henry D. Lloyd exposes the tricks and frauds of speculation in grain, and maintains that they should be repressed by law. "Woman in Politics," by ex-Surgeon-General Wm. A. Hammond, is a caustic discussion of certain facts of nervous organization which in his opinion render the female sex unfitted for participation in public affairs. Hon. Francis A. Walker reviews "Henry George's Social Fallacies," criticizing in particular his doctrines regarding land-tenure and rent. The evils resulting from "Crude Methods of Legislation," both national and State, are pointed out by Simeon Sterne, who advocates the adoption of certain rules, both against lobbying and against the mischiefs of ill-considered law-making. Charles F. Wingate writes familiarly and warningly of "The Unsanitary Homes of the Rich," and there is a joint discussion of "Science and Prayer," by President Galusha Anderson and Thaddeus B. Wakeman.

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THE *Magazine of American History* is now edited by Mrs. Martha J. Lamb, whose ability, good taste, literary skill, and extensive scholarship eminently fit her for the position. Her History of the City of New York long since established her reputation as an author, and her present undertaking, The History of Wall Street, will abundantly sustain that reputation.

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W. O. AYRES, in *Cotton, Wool, and Iron*, in an exhaustive article upon "Our Future Sugar," says in conclusion: "But enough has already been accomplished to settle fully and fairly the fact that sugar, equal in every respect to that from sugar cane, can be made from sorghum; that there is no greater uncertainty and no greater skill required in the one case than in the other, neither is the expense of production greater; that an acre of land in New Jersey, Ohio, Iowa, or Kansas will yield as much profit from its sugar and molasses of sorghum, as an acre in Louisiana from its sugar cane."

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THE Kansas City REVIEW OF SCIENCE AND INDUSTRY is a creditable magazine, maintaining a standard of excellence under the editorial management of Theo. S. Case that places it among the best scientific publications in the country.—*Leavenworth Standard.*

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THE *Atlantic Monthly* for August presents the following table of contents: A Roman Singer, III., IV., F. Marion Crawford. The Trustworthiness of Early Tradition, Brooke Herford. En Province, II., Henry James. Glints of Nahant, Charles F. Lummis. The Hare and the Tortoise, Sarah Orne Jewett. Academic Socialism, Herbert Tuttle. To a Hurt Child, Grace Denio Litchfield. Newport, III.–V., George Parsons Lathrop. The Gift of Tears, Mrs. S. M. B. Piatt. Reminescences of Thomas Couture, Ernest W. Longfellow. In the Old Dominion, F. C. Baylor. Study of a Cat-Bird, Olive Thorne Miller. Around the Spanish Coast. Charles Dudley Warner. A New History of the United States. John A. Dix. The Reminiscences of Ernest Renan. The Contributors' Club. Books of the Month.

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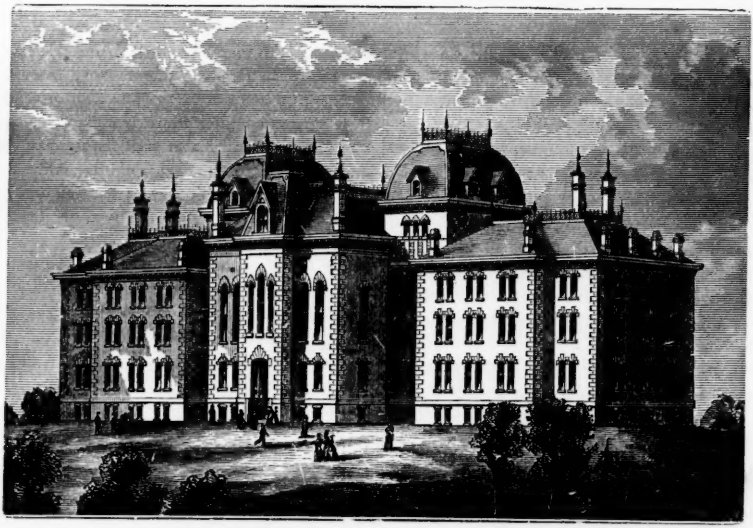
To all lovers of exploration and travel who can read French we most cheerfully recommend *L' Exploration*, edited by M. Paul Tournafond, 6 Rue Cassette, Paris, France, 30 francs per annum.



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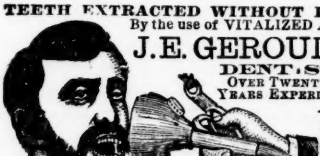

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